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FROM

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Received April 25, 1888.

TREATISE

ON THE

ART OF WEAVING,

&c. &c.

TREATISE

ON THE

ART OF WEAVING,

&c. &c.

A TREATISE

ON THE

ART OF WEAVING,

WITH

CALCULATIONS AND TABLES

FOR

THE USE OF MANUFACTURERS.

170-22

BY JOHN MURPHY,

AUTHOR OF "THE MANUFACTURER AND WEAVER'S COMPANION," AND OF "CLOTH MANUFACTURE,"
AND OTHER ARTICLES IN THE ENCYCLOPEDIA EDINENSIS.

ILLUSTRATED BY ENGRAVINGS.

THIRD EDITION, REVISED AND ENLARGED.

GLASGOW:
BLACKIE & SON, AND A. FULLARTON & CO.;
W. CURRY, Jun. & CO., DUBLIN; AND SIMPKIN & MARSHALL, LONDON.
1831.

~~VI~~ 4925
Tec 1908.31

HARVARD COLLEGE
APR 25 1888
LIBRARY.

John Harvey Treat.

Edward Khull, Printer, 65, Virginia Street, Glasgow.

PREFACE.

It were vain to search for the origin of Weaving amidst the darkness of remote ages, although there can be no doubt of its having an equal claim to antiquity with any of the other arts, which contribute either to the necessaries, the comforts, or the luxuries of the human race. In the state of nature, the wants of man are comparatively few, and are usually supplied by the most simple and obvious means; yet there is scarcely a nation or tribe to be found in the savage state, however rude or uncultivated, who have not some notions of interweaving fibrous substances into cloth, either for ornament or use; and many of the productions of these people display no common degree of ingenuity. It is not, however, till nations have emerged from a state of barbarism, advanced considerably in civilization, and begun to indulge in the pleasures of luxury, that the useful and ornamental arts are cultivated with assiduity, and brought to their most refined state of perfection.

The Egyptians were the first civilized people of whom there are any authentic records, and to them the neighbouring nations were chiefly indebted for their knowledge in the arts and sciences: among which was the art of Weaving, especially of fine linen, for which they were widely famed. The Israelites, in particular, as appears from the book of Exodus, had acquired an extensive knowledge of the useful and ornamental arts, during their abode in that land; for we find, not long after their departure thence, the names of Aholiab and Bezaleel, the greatest artists of their time, associated with the graver, the embroiderer, and the weaver, in preparing the ornaments for the tabernacle. The Greeks were likewise greatly indebted to the Egyptians for their knowledge, both in the arts and sciences; and of them they learned the culture of flax and weaving of linen. The Romans, again, borrowed many of the useful arts from the Greeks, and spread a knowledge of them as far as they carried their victorious arms.

With respect to the processes or manipulations of Weaving as conducted by the ancients, nothing satisfactory can be gathered from history, although it is highly probable that they were either the same, or similar to those at present practised by the natives of India. One thing, however, is certain from their fables and sculptures, that the Egyptians, Greeks and Romans, spun their yarns with the distaff and spindle: and it has been remarked that these simple implements have been used for spinning in all the countries which have been discovered by navigators for the last three centuries. They are still employed by the natives in the East Indies; and they were common in Scotland in the middle of the last century.

That the art of Weaving was unknown in Britain before the Roman invasion, at least for the purposes of clothing, will appear from the following curious picture of its inhabitants at that period, drawn by the great poet Milton. "At Cæsar's coming hither," says he, "such likeliest were the Britons, as the writers of those times and their actions represent them, in courage and warlike readiness, to take advantage by ambush or sudden onset, not inferior to the Romans, nor Casibelan to Cæsar, in weapons, arms, and skill of encamping, embattling, fortifying, overmatched; their weapons were a short spear and light target, a sword also by the side; their fight sometimes in chariots, fanged at the axle with iron scythes, their bodies most part naked, only painted with woad in sundry figures, to seem terrible as they thought; but if pinched by enemies, not nice of their painting, to run into bogs up to their necks, and there stay many days, holding a certain morsel in their mouths no bigger than a bean, to suffice hunger: Their towns and strongholds were spaces of ground fenced about with a ditch, and green trees felled overthwart each other; their buildings within were thatched houses for themselves and their cattle: In peace the upland inhabitants, besides hunting, tended their flocks and herds, but with little skill of country affairs; the making of cheese they commonly knew not; wool and flax they spun not; gardenery and planting, many of them knew not; clothing they had none but what the skins of beasts afforded them, and that not always; yet gallantry they had, painting their own skins with several portraitures of beast, bird or flower."

After the Romans had obtained a footing in Britain, they established a woollen manufactory at Winchester for clothing their army, and also taught the natives the art of Weaving and the culture of flax. The Saxons afterwards introduced the manufacture of several kinds of cloth, chiefly for domestic purposes; among which is said to be the weaving of counterpanes.

Little farther is known of Weaving in Britain till early in the fourteenth century, when Jack of Newbury introduced the manufacture of broad woollen cloth, which was afterwards protected and encouraged by King Edward III., and which has ever since been the staple of England. The following extracts, however, from Anderson's Progress of the Arts and Sciences, and others, will exhibit the state of the cloth manufacture in Europe from this period till the end of the seventeenth century, when a new era may be said to have commenced in the history of the arts in Britain.

ANNO.

1209. Venice gains the silk manufacture from Greece.

1248. A company of wool merchants settle in London.

1253. Some fine linen made in England.

The latter end of this century the better sort of people wore woollen shirts: the most considerable citizens gave not above one hundred livres for a daughter's portion. But now, says Lafflamma, we wear linen. The women wear silk gowns, some of which are embroidered with gold and silver.

Table linen was scarce in England.

1305. The city of Louvain in Flanders, with the adjacent villages, were said to contain above an hundred and fifty thousand journeymen weavers.

1327. The first broad cloth made in England by Jack of Newbury.

1331. King Edward III. resolves to promote a woollen manufactory in England, and to this end brings seventy families of Walloons into England.

1336. Two Brabant weavers settle at York with the king's protection; as it may prove, said the king, of great benefit to us and our subjects.

1337. Laws enacted for encouraging the woollen manufacture in England.

Holland gains part of said manufacture from Flanders and Brabant.

1339. Looms set up in Bristol for woollen cloth.

1348. Norwich eminent in the worsted manufacture.

French fashions introduced into England.

1351. Foreign weavers numerous in London.

ANNO.

1376. Woollen cloth made in Ireland.

1380. The city of Louvain loses its manufacture, by an insurrection of the journeymen weavers.

1386. A company of linen weavers established in London.

1390. Coarse cloth made at Kendal.

1398. Foreign woollen cloth first prohibited in England.

1436. Coventry eminent for the woollen and cap manufacture.

1455. Some silk manufacture carried on by women in England.

1488. Woollen cloth not to be exported until fully dressed.

1519. Spain loses her woollen manufacture, which she has not been able to regain to this day.

1521. France first gains a silk manufacture.

1533. Hemp and flax ordered by statute to be sown in England.

1537. Halifax in Yorkshire commences the woollen manufacture.

1549. King Edward VI. encourages foreign protestants to settle in England, viz. Walloons, Germans, French, Italians, Polanders and Switzers, who much advance manufactures and trade.

1567-8 Persecutions of the protestants in France and the Netherlands, under the Duke of Alva, drive many of them into England, where they establish a variety of manufactures.

1582. Value of woollen cloth exported from England, £200,000 annually.

1590. Manufacture of sail cloth first introduced into England.

1597. Logwood, by law, forbid to be used in dyeing, but afterwards found to be of great use.

1608. Silk worms brought into England.

1614. Dyeing cloth in the wool first invented.

ANNO.

1619. Tapestry work first introduced into England.

1620. Broad silk first manufactured.

1622. The woollen manufacture in a declining state.

1624. The Dutch make woollen cloth to the amount of £25,000 a-year.

1641. Ireland spins linen yarn for Manchester, who returns it to them made into cloth.

1643. Bow dye or scarlet first made.

1646. The French begin their manufacture of fine woollen cloth, under the patronage of Cardinal Mazarine at Sedan.

1650. The worsted manufacturers of Norwich incorporated.

1654. The fine broad cloth of England sent to Holland to be dyed.

1663. Forty thousand men, women and children employed in silk throwing, in and near London.

1666. Burying in woollen established by law.

1667. Dyeing and dressing woollen cloth perfected in England, by one Brewer from the Netherlands.

1668. The Scots send linen yarn to England.

1670. The wear of muslins first introduced.

The linen manufacture began to be encouraged in Ireland, where it is very considerable.

1685. Seventy thousand refugees came from France on the revocation of the edict of Nantz, (by which edict the protestants there enjoyed the public and free exercise of their religion) and settle in Great Britain and Ireland, bringing with them the blessings of industry, and an extensive knowledge in many manufactures yet unknown there; of these two thousand are supposed to have gone to Ireland. The whole number, who, for conscience' sake, quitted their native country, are said to have been 800,000; they distributed themselves in

Holland and Brandenburgh, where they erected the fabrics of cloth, serges, stuffs, druggets, crapes, stockings, hats, and all sorts of dyeing; and among them were goldsmiths, jewellers, watchmakers and carvers. Many settled in Spittalfields, London, where they erected the manufacture of silk, and helped to people the suburbs of Soho and St. Giles; by them was introduced the art of making crystal, which was entirely lost to France.

1696. A law to prevent the exportation of English wool, and the importation of Irish.

Hemp, flax, linen, thread and yarn from Ireland, admitted duty free. (This law gave rise to the now happy state of the linen manufacture in Ireland.)

From these extracts it will appear that Britain and Ireland were first indebted to the bigotry and persecuting spirit of the continental powers of Europe, in the sixteenth and seventeenth centuries, for many of the useful arts which they now enjoy, and which laid the foundation of some of our most extensive manufactures.

The cloth manufacture made little progress in Scotland till after the Union, when it was greatly promoted by the fostering care of the Board of Trustees, which was established by charter at Edinburgh, in the year 1727, for protecting and encouraging the Scotch manufactures and fisheries. The greater part of the goods manufactured in Scotland, however, were made of linen yarn, till about the year 1759, when a branch of the silk trade from Spittalfields, London, was established at Paisley, where it was brought to such perfection, especially in the more light and fanciful kinds, that in a short time, Paisley silks not only rivalled those of the south, but had a preference in all the markets in Europe; and this laid the foundation of that extensive knowledge of fancy weaving, for which the tradesmen of Paisley have since become so famous, and which is now spread over the west of Scotland.

About the same period, the increasing demand for cotton goods, induced several individuals to attempt a more ample supply of yarn, to meet an extension of this branch of manufacture; but all without success till the year 1767, when Richard Hargreaves, a weaver in Lancashire, invented the cotton jenny, which, though at first it contained only eight spindles, was afterwards enlarged, so as to contain 20, 30, and even 80. And about two years after this invention, Sir Richard Arkwright improved the spinning of cotton still farther, by the application of water for the moving power, &c.; together with the addition of rollers, and other modifications of the machinery. The extension of this rising manufacture now became so rapid, that it would soon have felt a serious check, had not the discoveries in chemistry which were made about the same time, come in to its aid, particularly in the processes of dyeing and bleaching; by the latter of which, the manufacturer was enabled, instead of a process of some months, to bring his goods to the market in the course of as many hours after they came from the loom. These inventions and discoveries, together with the improvements in calico printing, the discharging of colours, particularly of Turkey red for Bandanas, the application of steam for the moving power, and innumerable other discoveries in mechanics and chemistry, which would fill a volume to give in detail, have contributed, within the last forty years, to raise the cotton manufacture to a state of perfection and extent unknown in the history of commerce.

Having thus given a short account of the progress of weaving in Britain, from its first introduction to the present time, it may not be improper to add a few words with respect to the subject itself, and the work which is now offered to the public. The art of Weaving naturally divides itself into a number of separate or distinct branches, differing so materially in principle, that an experienced tradesman in one branch, is often as much a stranger to some of the others, as any other mechanic; while at the same time, the constant demand for novelty and variety, to give life and vigour to our commerce, and to maintain a competition with foreign rivals, render a general knowledge of the art, in all its parts, of the utmost importance both to the manufacturer and operative tradesman. But as this great object is scarcely attainable by practical application, it can only be supplied through the medium of the press. From this consideration, therefore, the present work was first undertaken; how far it may be found to answer this important end, time, and an enlightened public, only can determine.

In the fancy weaving department of the work, the different branches of the art have been explained under their respective heads, and arranged in the most simple and natural order that presented itself after much study and reflection; and their general connexion and dependence on each other as a system, have been exhibited and illustrated in such a manner, that any person of moderate acquaintance with the art, may, with a little attention, easily comprehend the whole; and be able to apply the principle of any one branch, to the extension and improvement of another, so as to give the greatest diversity to his patterns.

In this new and improved edition of the work, every attention has been paid to the silk branches of weaving, which, since the reduction on the importation duty took place, has become an object of general interest among the manufacturers of fancy goods in this country. On revising the work, the fundamental branches of weaving, applicable to this manufacture, have been pointed out, and a considerable quantity of new matter introduced, chiefly to explain the method of weaving those fabrics and textures which have been brought into the trade since the publication of the first edition. Among these will be found Canton crapes, Turkey gauze and piquet stripes, Turkey gauze harness', on the newest and most approved construction; likewise Kamschatka or Chenille shawls, &c. And, in order to embrace every improvement in the draw loom department to the present time, a description of Cross's machine, or counterpoise harness, with illustrative engravings are given, and also an engraving and description of the new French draw loom for superseding the draw boy, which has been introduced into this country since Cross's machine was made public. And to render this work still more complete, an elegant engraving of the power loom and dressing machine, with a minute description, are added; together with a beautiful engraving, representing an Indian family employed in the different processes of the cotton manufacture.

The thirteenth Chapter, which may be bound by itself, is more immediately intended for the use of the manufacturer. It contains a number of tables to facilitate calculation: the rules, however, which are there laid down, will not only explain the principles on which these calculations are founded, but will be useful, if committed to memory, when tables are not at hand. The prices of cotton yarn also, in this edition, have been extended to embrace the general trade. The years 1825 and 1826, have exhibited extremes in the rise and fall of cotton yarn, which are not likely to be exceeded in this country for a long time; and therefore, these tables have been adapted to the present state of our manufacture, with a sufficient allowance for any contingent rise or fall in the prices.

The Author cannot close this preface without expressing his warmest acknowledgments to the Honourable Board of Trustees, Edinburgh, for their liberal Donation towards defraying the expenses of its first publication.

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A
TREATISE
ON THE
ART OF WEAVING.

CHAP. I.

Construction of Loom Mountings.

SECT. I. OF THE SEVERAL PARTS OF A MOUNTING.

The art of Weaving, with respect to its elementary principles, may be divided into the six following branches, namely, plain texture, tweeling, double cloth, spotting, flushing, and crossed warps; for, to one or other of these, or to some of their combinations, may be referred every variety of texture or ornament which is produced in the loom.

All the diversity of which these fundamental branches are susceptible, arise from the mode in which the threads of warp are separated, or the sheds opened, to receive the woof. The apparatus or mountings which, in ordinary cases, are employed for this purpose, consist of heddles variously arranged on shafts, and connected to an assemblage of levers, which are put in motion by the weaver's feet. Patterns, however, which are too extensive to be conveniently woven on this principle, are executed in the draw loom, in which every diversity of ornament may be produced, and the range of the pattern carried to any practicable extent.

The heddles, which constitute the essential part of a mounting, are of various constructions: some are clasped, as represented at A, fig. 1, plate 1; others are made with eyes as at B in the same fig. and those employed in cross weaving have half heddles attached to certain parts, to assist in crossing the threads of warp. The clasped heddles are chiefly in use for plain fabrics, or where little mounting is necessary. The thread of warp enters between the clasps where the dot is placed in the fig.; and, should the yarn be weak or soft in the undressed state, the clasps, when drawn together, prevent it, in a considerable degree, from being unequally strained behind the mounting. The eyed heddles are chiefly appropriated to fancy mountings, as the eye passes with more facility over any obstructions that may remain on the warp after it is dressed.

When eyed heddles are intended for the lighter fabrics of cloth, one single knot of the twine is sufficient to form the eye as represented in the fig.; but for the stouter fabrics, such as the general run of customary weaving, the eye requires two knots to prevent it from slipping.

Each leaf of heddles is fastened to two shafts, one above and one below, by means of cords called the maitland cords, or backings, on which they are knotted at the proper distances for the given set of reed, though, for some kinds of coarse cloth, they are made to shift along the cords, to suit different sets of reed, or to produce a variety of pattern by the same mounting. In fancy mountings, however, when adapted to any particular pattern, it is more advantageous to have each portion of the heddles cast or knotted on the cords opposite those spaces of the cloth which they are respectively to weave.*

---

* The twine of which heddles are constructed is made of linen yarn, cotton, silk, or worsted, according to the species of work on which they are to be employed. Twine made of linen yarn, which is now chiefly confined to warps

The levers which are employed for raising and sinking the leaves, in most of the branches of fancy weaving, are coupers, long marches, short marches, and treddles. In

---

of the same material, or for the construction of harnesses, is made of three threads or ends laid together and well twisted. It is wound on a reel 90 inches in circumference, and tied in cuts which should contain 120 threads; but owing to waste and the diminution occasioned by twining, it seldom exceeds 110. Heddle makers usually make their calculations by the hank, which is four of these cuts, equal to the fourth part of a spyndle of single yarn.

Cotton twine, which is now in general use for cotton and linen warps, is composed of five ends twisted together, and made up into cuts and hanks of the same length as the linen twine: but as the cotton runs somewhat longer than the linen, the cut will contain about 120 threads.

Heddle twine made of silk is usually called liesh, and is for the most part employed for silk warps, or for the doups and bead-lams in cross weaving. Liesh, however, is now made of cotton yarn for the last purpose, and consists of 6, 9, 12, and sometimes even of 15 ends or plies. These ends are first made into strands of 2, 3, 4, or 5 threads each, and then three of these strands twisted together make the 6, 8, 12, and 15 ply liesh respectively. Worsted twine has been employed for the same purposes as the linen and cotton twine, though not to any great extent.

There is no precise rule for adapting the grists of heddle twine to the different grists of warp; for this in a great measure will depend on the fabric of the cloth, as well as the opinion of the weaver. Mr. Alexander Peddie, indeed, has given a table for this purpose in his book on weaving; but, as it is well known that the grists or fineness of warps, for the same fabric of cloth, vary as the squares of the reeds, and his grists of twine are computed simply as the number of the reed, it is evident that, when the grist of the twine is suitably adapted to one set of reed, the greater the difference between this and any other set, the more will the grists of the twine and warp be at variance. For example;—according to Mr. Peddie's table, if 8 oz. twine suit 600 heddles, 4 oz. will make heddles for 1200 of the same fabric. This proportion is simply as the number of the reed. But were the grist of the twine to vary as the grist of the warp, it would be as

$$6 \times 6 = 36 : 8 :: 12 \times 12 = 144 : 2,$$

reciprocally, that is, only half the weight Mr. Peddie makes it.

fig. 2, plate 1, which is a view of a four leafed tweel mounting, A are the coupers, B, the long marches, C, the short marches, and 1, 2, 3, 4, the ends of the treadles, as seen from the back of the loom. As the coupers A have the bolt or fulcrum *i* between the weight and power, they are termed, in mechanics, levers of the first order; and, as the centre of motion is generally from one-third to two-fifths of the whole coupers from the weight to be raised, or where they are connected to the leaves by the cords *n n*, the power will be increased in the same proportion. Again, as the power, which is the pressure of the foot on the treadles, acts on the long march B between the weight and prop or bolt *m*, this march is said to be a lever of the third order; but instead of giving an increase of power, this lever diminishes it in proportion as the treadle cord is tied towards the bolt. The long march therefore is applied merely for the purpose of changing the direction of the power, or raising the leaf to which it is connected by pressing down the treadle. When any treadle is connected to the short march C on the side of the cords *a* farthest from the bolt, the march becomes a lever of the second order; but when tied between these cords and the bolt, it is then a lever of the third order, and diminishes the power in the same manner as the long march. The short march, however, is neither intended to increase the power nor change its direction, but to afford the means of connecting a number of treadles to the same leaf, while the power is exerted constantly on its centre. The ends only of the treadles 1, 2, 3, 4, can appear in this view of the mounting. When their centre of motion, or heel bolt, is placed either below or behind the weaver's seat, they are levers of the third order; and, therefore, the farther back he works with his feet, the greater effort is necessary to open the sheds. In heavy mounted looms, however, it is found advantageous to reverse the position of the treadles; and then the weaver works upon the ends farthest from the bolt, which gives him a considerable increase of lever power, although attended with a deeper tread.

SECT. II. DRAUGHTS AND CORDINGS.

A draught and cording, draught and tie, or draught and tie-up, as it is termed in different manufacturing districts, is a small plan of the leaves and treadles of a mounting, on which are represented the order or succession in which the warp threads are drawn through the heddles, and the leaves pointed out which are to be raised and sunk by each treadle. The annexed figure is the draught and cording of a four leafed tweel, corresponding with the mounting at figure 2, plate 1.

No. 1.

d	*c*	*b*	*a*		
		0	0	1 1	A
	0	0		2 2	B
0	0			3 3	C
0			0	4 4	D
1	2	3	4		

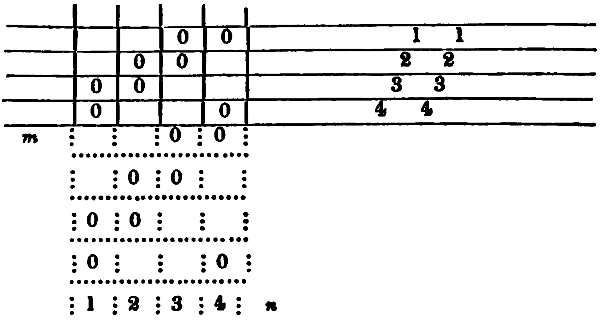
In this plan the spaces marked A, B, C, D, represent the leaves, and those marked *a*, *b*, *c*, *d*, which cross them at right angles, the treadles. The figures 1, 2, 3, 4, on the leaves, show the succession of the draught, or denote that the first thread of warp is taken through a heddle on the leaf A, the second, on the leaf B, the third on C, and the fourth on D, and this is said to be one set of the pattern, or once over the draught. The cyphers on the spaces *a*, *b*, *c*, *d*, show what leaves are raised by each treadle, respectively, while working over the pattern; the blank squares, at the same time, exhibiting such as are sunk. This distinction, however, is merely arbitrary, for in some instances it is more convenient to mark the sinking cords, and leave the raising ones blank, as is usually the case in cordings for jacks or stocks and pulleys. It is pretty generally understood, however, that the raising cords are marked on cordings for coupers and marches, and the sinking ones left blank, unless something to the contrary be mentioned. In the present example there are marks on the treadle *d*, where it crosses the leaves C and D, and blanks where it intersects A and B: the two former leaves, therefore, are raised, and the two latter sunk by this treadle, to open the first shed. The same is to be understood of the other treadles of this, or any other plan of cording which is not otherwise described. The figures on the treadles likewise show the order in which they are wrought over to produce this tweel.

When the succession in which the threads of warp are drawn through the leaves is exhibited by numbers, as is usually the case in complex draughts, it is evident that the highest number will show how many threads, or at least heddles, are in one set of the pattern. Sometimes, however, to save room, the threads are represented by small lines drawn across the leaves, as at N fig. 3, where each line denotes a single thread, or what is drawn into each heddle. In some branches of weaving, also, it is found convenient, for the same reason, to mark a whole draught over a certain portion of leaves, with one straight line, as at O in the same figure.

If we suppose the warp of any web to be divided into two equal parts, namely, those portions which are drawn, respectively, on the back and front leaves of a plain mounting; then, that half which belongs to the back leaf will consist of the odd numbers 1, 3, 5, 7, &c. beginning with number 1 on this leaf; and the even numbers 2, 4, 6, &c. will, of course, be drawn on the front leaf. In whatever manner, therefore, the draught of any pattern may be diversified, be the number of leaves what it may, provided an odd and an even number be not drawn on the same leaf; if a raising cord for each leaf that contains the even numbers, be put on one treadle, and the reverse of this cording be put on another treadle; then, these two treadles wrought alternately will convert all the warp in the draught into plain cloth. This observation will be found useful in many cases, especially where the draught is much diversified, as will appear in many of the examples given in the course of this work.

In the preceding, and all other plans of cording whose draughts run straight over the leaves, and the order of treading is in the same regular succession over the treadles, the raising marks will form one complete set of the pattern on the cording plan: for as, in the specimen already given, the mounting produces a biassed stripe of flushing when the treadles are wrought over in the order of the figures 1, 2, 3, 4, each shot of woof passing, alternately, over and under two threads of warp, the raising marks will be found to assume a similar form on the treadles *d*, *c*, and *b*; but at the leaf A and treadle *a*, the run of the stripe appears to be interrupted. As the same set of leaves, however, must repeat the pattern, the raising mark which seems to be wanting on the back part of the mounting is brought forward by passing the two leaves B and C, their common distance, to the leaf D, and forms a part of the succeeding stripe. This will more obviously appear by repeating the cording, as in the annexed figure.

No. 2.

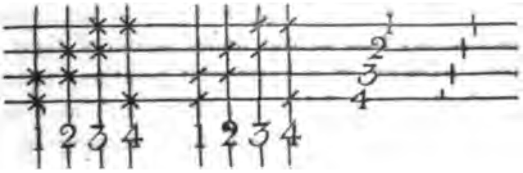


The preceding remark requires particular attention, especially in making cording plans of considerable extent; for even in this small specimen it is obvious, that, wherever the run of the pattern breaks off at one side of the plan, it must be continued on the succeeding leaves and treadles at the opposite side. This will also be sufficiently exemplified in the plans given under fancy tweeling.

The form of the draught and cording here described is common in the manufacturing districts of Scotland and north of Ireland; but in England their construction is somewhat different, which it will be necessary here to explain. Instead of marking the order of the draught and cording on the spaces, as in the preceding example, the English weaver puts his marks on the lines, which thus become the representatives of the leaves and treadles. The following specimen, which is the draught and cording of the four leafed tweel already explained, will enable the reader to understand any draught and cording of this form that may occur.

No. 3.

Thus. Or thus.



When two or more species of weaving are combined in the same web, the draught of each kind is drawn, in spaces, on its respective mounting, and the cords are placed on the treadles so as to open the compound sheds. But this part of the subject will be better understood after the fundamental branches of weaving have been explained.

SECT. III. MOUNTING WITH COUPERS. *Plate* 1.

In all looms mounted with coupers, except those for crossed warps, each leaf has its couper, and its long and short marches: in cross weaving, every upper shaft has its couper and long march, and every under shaft has its short march.

The coupers are placed in the frame D, fig. 2, called the top-castle, or heddle bearer, which rests on the side rails of the loom *i*, *i*, and are kept in a horizontal position, during the process of mounting, by means of another small frame, known by the name of the mounters or justers. The end of each couper, which is placed immediately over the centre of the loom, is connected to the upper shaft of its respective leaf by the bow-cords *n*, *n*, which, in general, are tied at the distance of about one-fourth of the breadth of the web from each side. The other ends of the coupers project over the web, towards the side of the loom, immediately above the ends of the long marches, to which they are respectively connected by the cords *e*. The long and short marches are fixed on their centres by small bolts, into the march frame *m*, at the opposite side of the loom. The short marches are tied to the under shafts of their respective leaves, likewise in a horizontal position, equally distant from the leaves and long marches, and at a sufficient distance from both, to prevent their coming in contact when the sheds are opened.

When the weaver has arrived at this stage of his process, which is invariably the same in all looms mounted on this principle, he proceeds to tie up the treadles agreeably to the plan of the intended pattern. For this purpose he places his cording before him, and observes which are the raising, and which the sinking cords on each treadle. He commences with the first treadle, to which he connects all the leaves which have the raising marks, by their long marches, and all the others, by their short marches. Thus he proceeds with the other treadles, until the whole are tied up. For example, in the plan of mounting already described, there are raising marks on the treadle *d* where it crosses the two leaves C and D; consequently the long marches of these two leaves must be tied to this treadle. But, as there are no marks on the squares where the leaves A and B cross it, sinking cords, as formerly mentioned, are understood; and therefore this treadle is connected, directly, to the short marches of these two leaves. In the same manner the long marches of the leaves B and C, and the short marches of A and D, are all connected to the treadle *c*; and so on with the remaining treadles. All these connexions are formed by running knots, termed snitches, known to every weaver, by which any part of the mounting may be tempered to the artist's satisfaction.

SECT. IV. MOUNTING WITH JACKS.

The method of mounting looms described in the last section is general, and may be applied to any number of leaves that can be practicably employed. There are other methods, however, which, though more limited, are found more advantageous in some particular branches of weaving. The method of mounting with jacks, which is now to be explained, is of this description, and is generally adopted for weaving plain textures, and in some of the smaller tweel mountings.

Fig. 4 is a front view of a loom mounted with jacks, adapted to a plain fabric. A is the heddle bearer, which, as in the last mounting, is supported by the side rails or capes of the loom, which are seen in section at *i*, *i*; B, the two leaves of heddles; *u*, *v*, the two pairs of jacks, suspended from the heddle bearer by their centres; *n*, two small rods in the under doups or bows of the two leaves, respectively. When these rods are drawn up to the clasps of the heddles by the handle *o*, the clasps are opened, and the threads of warp are permitted to pass through them without obstruction. At *x* are two spring shafts which form the connection between the under shafts of the heddles and their respective short marches *y*. G is a part of the march frame, and *t*, *t*, are the ends of the treadles.

By examining the fig. it will appear, that each jack is connected by one end to one leaf, and by the other, to another; so that it would seem that one jack at each side of the loom would be sufficient for a plain fabric: but it is usual to employ two jacks at each side of these mountings, for steadiness, one crossing the other, which, when the loom is at work, move always in opposite directions. There are other methods of mounting jacks, principally with a view to facilitate the shifting back of the heddles; one of which is very common, that is, by what are termed tumblers, for slackening the heddles above when requisite; but the method given in the drawing is the most simple, and at the same time equally convenient with any of the others.

Fig. 5 shews the manner in which the jacks are connected to the leaves of a four leafed tweel. In this plan the double lines A B and C D represent one set of jacks, nected to the leaves of a four leafed tweel. In this plan the double lines A B and C D represent one set of jacks, which are connected to their respective leaves at the points on which they terminate. The leaves *a b* and *c d* represent another set of jacks, shorter than the former, which are suspended from the heddle bearer, or tumbler, if employed, a little farther down; but their connexions with the leaves are reversed, so as to move in contrary directions, when at work. The small jacks are added merely for the purpose of keeping the leaves steady when they are raised and sunk, as formerly noticed.

It has been already observed, that there are no raising marks necessary in mounting with jacks, the blank squares, only, pointing out the cords to be tied to the treadles; but if a plan of cording be made on purpose for jacks, the sinking cords are marked, and the blank squares, of course, signify nothing. As the marks, therefore, on Fig. 5 denote sinking cords, the sheds which each treadle produces will stand as under,

Treadle 1 sinks the leaves B. and D. and raises A. and C.
——— 2 ——————— A. —— D. ——— B. —— C.
——— 3 ——————— A. —— C. ——— B. —— D.
and 4 ——————— B. —— C. ——— A. —— D.

Jacks are also employed sometimes in the higher mounted looms; but as it is necessary to have two jacks for each leaf at both sides of the web, for the reason already stated, so many jacks would render the mounting difficult to adjust in the event of the smallest derangement. Besides, by the nature of this mounting, when any leaf is sunk, the leaf connected to the other end of the jack must be raised; and therefore, in the present form, jacks can only be applied when one of the leaves with which it is connected is raised and the other sunk, whereas, in the method of mounting with coupers, any one or more leaves may be raised or sunk, independently of all others, which renders this method of general application.

Jacks are, however, sometimes mounted in such a manner that any leaf may be raised or sunk without affecting any other, which is effected by fixing a small screw pulley into each end of the jack, and connecting the leaves over these pulleys; but it is seldom these contrivances are put in practice.

SECT. V. MOUNTING WITH STOCKS AND PULLEYS.

This simple apparatus is chiefly employed by customary weavers for strong fabrics, to which it is better adapted than either of the preceding; not only on account of its being equally steady, but because it is capable of sustaining considerably more stress. Like the jacks, however, it is very limited with respect to the power of raising and sinking the leaves, though some contrivances have likewise been introduced to obviate this objection.

At A, fig. 6, is exhibited a method of mounting a three leafed tweel on this principle.—*a* is a section of the heddle bearer, to which the cords *c* and *d* are fixed. The upper shafts of the three leaves are seen at *b*; and these are connected by the pulleys in the manner represented in the fig. To the under shafts 1, 2, 3, of these leaves, are connected the three treadles, in the same manner as seen in fig. 4.

As each treadle sinks only one of these leaves in forming the sheds, while the other two rise, it will appear, that when the leaf No. 1 is sunk by the treadle, it will raise the double pulley *e*, together with the two leaves 2 and 3. But as *i* is a fixed pulley, it will follow from mechanics that, when the leaf No. 1 sinks, for example, two inches, Nos. 2 and 3 will thereby be raised, with the pulley *e*, only one inch. Again, when No. 2 is sunk two inches, the double pulley *e* will be drawn down half an inch, by which No 1 is raised one inch, and No. 3 will, of course, rise one inch and half to be on a level with No. 1, so that when No. 2 sinks two inches, Nos. 1 and 3 actually rise only one inch as in the first shed. As the leaf 3 has the very same connexion with No. 1. that No. 2 has, it is evident, that when it is sunk two inches, the others will, as in the former cases, be raised one; and therefore these three sheds will be equal, although the sinking leaf passes through double the space of the risers. In some species of weaving, however, this inequality in the two parts of the shed would be a very material objection; but as it is necessary, in stout fabrics, to have the upper part of the shed slacker than the under part, to allow the woof to go on more easily, and for which the yarn beam is commonly raised higher than the cloth beam, this becomes rather an advantage.

Fig. 7 is a stock with two pulleys, mounted for a four leafed tweel. Its draught and cording, with the manner in which the leaves are connected, are marked in the following plan.

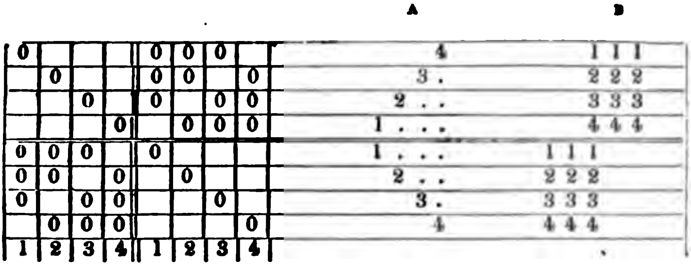
No. 4.

0			0	A	1	A
	0	0		A	3	A
		0	0	B	2	B
0	0			B	4	B
4	3	2	1			

Here the two back leaves A, A, are connected by a cord passing over the undermost pulley, and B, B, by another over the upper pulley. Now, it is evident, that when the treadle 1 is pressed down, it will sink the threads 1 and 2 of the draught; when the treadle 2 is pressed down it will sink 2 and 3; treadle 3 sinks 3 and 1; and 4, 4 and 1, which is one set of the tweel. Had the draught been straight over the leaves as in No 1, it would only be necessary to exchange the pulley cords of the two centre leaves.

A tweel damboard may be woven by a stock and four pulleys, as in the following scheme.

No. 5.



In this plan the figures at B are the draught, and those at A refer to the number of the pulleys: that is, the two centre leaves marked 1, 1, are connected together over the first pulley, 2 and 2, over the second, 3 and 3, over the third, and 4 and 4, over the fourth. The ciphers on the treadles may denote either raising or sinking cords; but this plan will be better understood after tweeling has been explained.

It has been already observed, that eyed heddles move back over the warp, when requisite, without any obstruction. Clasped heddles, however, must be slackened when set back, either from above or below, to relieve the threads between them. This is effected when the mounting will permit, by pressing down the upper shafts; but when the leaves are fixed above, as in the case of stocks and pulleys, the under shafts are raised for this purpose.

Fig. 8 is another method of mounting looms on a simple principle, which, though it does not come with propriety under stocks and pulleys, may be noticed here, as it is chiefly employed by customary weavers for extending the variety of sheds. It consists of two sets of coupers *a*, *a*, for each leaf, one connected to the other as represented in the fig. These coupers are connected to their respective leaves by the cords *b*: and the cord *e* passes from the couper through the centre of the warp to the short march *c*, to which it is tied. The treadle *x* is also tied to the short march; so that when the treadle is pressed down, it raises the outward ends of the coupers, and consequently the leaf to which they are attached. *V v* are two weights suspended from the other shafts, for sinking the leaves after being raised. As there are no sinking connexions in this mounting, the sheds are formed merely by raising the leaves. It is therefore necessary that the eyes of the heddles should be situated so low, that when the lay is put back to the proper position for throwing the shuttle, the warp may be all close to the race-rod.

SECT. VI. ARRANGEMENT OF TREADLES.

In many branches of fancy weaving, the raising marks on the treadles of the cording plan, form either the whole, or part, of the pattern to be produced, when the treadles are placed in their natural or progressive order, as in the preceding examples. This position of the treadles is sometimes very convenient for exhibiting the relation between the cording plan and the sketch of the figure on design paper; for the former very often conveys a pretty correct idea of the latter. But were the weaver to adopt this arrangement in practice, he would either be under the necessity of working over the treadles with one foot, or his legs would be often crossing in a very awkward manner, while shifting from one treadle to another, by which his operations would be greatly obstructed.

Different methods of placing the treadles of a mounting have, therefore, been adopted in the various branches of weaving, to obviate this inconvenience. In spot mountings, and such other varieties as have portions of their grounds woven plain, the plain treadles are usually placed in the centre, and those which are destined for the figured part, at each side, as nearly as possible, in equal portions. In tweels, and all the varieties in which the order of treading is straight over the treadles; if the treadles are numbered as in the foregoing examples, it is plain, that the right foot, when it commences the tread, will work on all the odd numbers, and the left, on the even ones. Suppose, therefore, all the odd numbers to be placed together at the right side, and the even ones at the left; then, the treadles may be corded so that the treading may either commence at the centre and proceed outward, or at the outsides, and work toward the centre; or, which is frequently the case, that one foot may commence at the outside and the other at the centre, and both work towards one side. For example, if we take the treadles of an eight leafed tweel whose progressive order would be 1, 2, 3, 4, 5, 6, 7, 8; then, in order to work them with both feet without crossing, they may be arranged in any of the following orders:

8, 6, 4, 2, 1, 3, 5, 7.
2, 4, 6, 8, 7, 5, 3, 1.
8, 6, 4, 2, 7, 5, 3, 1.

These arrangements are further exemplified under fancy tweeling.

In some of the other kinds of weaving, such as victories, crapes, &c. where one treadle works against a number, the left foot usually rests on that treadle, and the right works over the others in all their variations. In other cases, when only part of the treadles can be wrought alternately, as in velveteens, &c. two or more successive treadles are placed together, either for the right or left foot, at pleasure, and the weaver treads these in succession with one foot, and then works the others alternately. In some cases however, additional treadles are employed, to make the treading equal. In other instances, such as tweels with an odd number of leaves, all the treadles are placed in their natural order, and the weaver works over them all with one foot; or, when the treading returns in the same regular order, as in lined work, he works over the treadles from one side with one foot, and from the other side with the other. It frequently occurs, likewise, that one or more leaves are to be raised, occasionally, along with some of the leaves which form the principal sheds of the ground. In such cases, the treadles of these occasional sheds may be omitted, by screwing a small piece of wood, such as a piece cut off the end of an old shaft, to the point of the principal treadle, and applying to it the treadle cords of these additional leaves. These attached pieces are called tongues; and while the weaver continues to work the ground, he keeps his foot on the principal treadle only; but when the additional leaves are to be raised, he slips his foot forward on the tongue, and presses it down along with the treadle.

SECT. VII. SUBSTITUTES FOR TREADLES.

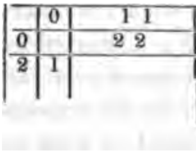
In all the preceding methods of mounting looms, it will be observed, that every shed must have its particular treadle; although the same shed may frequently occur in the course of weaving a pattern. There are, however, many kinds of fancy goods woven with leaves, in preference to the draw-loom, the patterns of which are so extensive, that, to employ the full complement of treadles, would not only embarrass the weaver, but, in many cases, be utterly impracticable. So far, indeed, has the predilection for leaves prevailed in some branches of weaving, that, in order to comprise as many as possible in a small compass, the heddles are made of different depths, and their respective shafts raised, one tier above another, to a sufficient height to prevent them from touching when the sheds are opened. Thus, for example, were a mounting to consist of ninety leaves, which is not uncommon for some of the finer kinds of silk patterns woven in England, and the shafts made about one eighth part of an inch thick, the whole, by arranging them in three tiers of thirty shafts each, might be comprised in about the space of five inches.

Before the invention of machines for opening the sheds of large mountings, the place of greater part of the treadles was usually supplied by a draw-boy. If the loom was mounted with coupers, the ends of all the coupers of those leaves which were to be raised to form each shed, were connected to a cord which descended at the side of the loom, and passing through a hole in a horizontal board, which regulated the distance of these cords, had a weight appended to keep it straight, and sink it after being raised. Each shed of the pattern, therefore, had its respective side-cord; and the whole were arranged in a straight line in the hole-board, in the same order as the sheds of the pattern occurred; so that the draw-boy had only to pull them in succession, along the board, as the sheds were required by the weaver. If, to save room, pulleys had been employed instead of coupers, then, it is evident that the cords passing over the pulleys must have been selected, and tied to the side-cords; though, in this case, a small tail would be necessary, as in the common draw-loom.

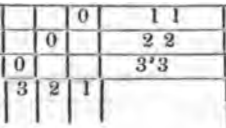
This simple mode of arranging the cords, which thus opened the numerous sheds of the most extensive patterns woven with leaves, is inserted, merely, to convey to the reader a distinct idea of the general principle on which a great variety of machines have been constructed, to supersede the use of a draw-boy in the different branches of weaving: for, however much these machines may vary in their forms, or to whatever species of weaving they may be peculiarly adapted, still it must be kept in view, that all the leaves which would have been raised by any particular treadle, must be here selected, and raised by the moving part of the machinery. It will only be necessary in this place, however, to illustrate the preceding observations by a description of one of these machines of the most approved construction; reserving the farther consideration of this subject till those branches of weaving shall have been treated of to which this species of machinery is usually applied.

Fig. 9, plate 1, is the front view of a machine called the parrot, from the pecking motion of that part which pulls the side or knot cords. The ends of the coupers are seen at A, and are numbered from 1 to 10 inclusive. The knots, or more frequently beads, which are catched by the parrot *e*, appear on the cords at *a a;* which cords are arranged in a straight line, and kept at equal distances by the two hole-boards B, B. At CC are the leads or weights appended to the knot-cords, which are, in the present example, thirteen in number. The parrot *e* is moveable along the square axle *o*, and is turned round by pressing down the treadle *i*, which is attached to the wheel D by a cord round its rim. The cord *w* is fastened to the parrot; and, after passing through a hole in the wheel D, it is wound about the inner part of the wheel *x*, which is turned by the hammer E working in its teeth. Whenever, therefore, the weaver has occasion to shift the parrot from one knot-cord to another, the hammer E is raised by a treadle, and, falling by the weight attached to it, the cross wire *y* catches one of the teeth and moves it one tooth round. Thus the length of each tooth must be such that the fork of the parrot will move exactly the distance of one bead from another. Fig. 10 is a side view of the parrot, as it is mounted for a double row of knot-cords, which are necessary when the sheds of a pattern are numerous. Fig. 11 is a view of the wheel D, with the hole *z*, through which the cord *w* runs. Fig. 12 is a front view of the wheel *x*. *p* is another wheel on the same axle, but moveable on its axis. *m* and *n* are two studs which regulate the number of sheds in the pattern: for, when the wheel *x*, which is fixed on the axle *o*, brings the index or handle *q*, by means of the stud *m*, round to the catch *s*, which takes place always at the end of the pattern, the catch *s* is raised out of the teeth, and the weight *t*, fig. 9, draws back the parrot until the stud *n* comes round to the handle *q*, which it displaces, and allows the catch *s* to fall again into the teeth of the wheel where the pattern is to recommence. From an attentive view of fig. 9 it is easy to perceive how the coupers and knot-cords are connected for each shed. For example, were the 3d, 5th, and 6th leaves to be raised for the first shed, each of these coupers would be connected to the knot-cord No. 1, at *g;* and so for every other shade of the pattern.

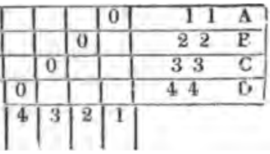
No. 1. Fig. 1.



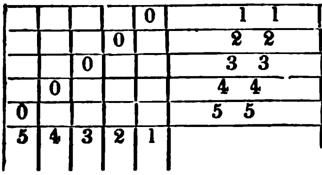
No. 2. Fig. 2.



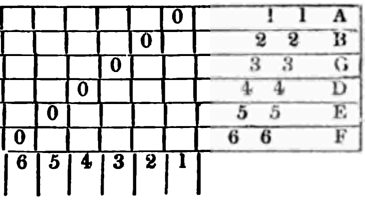
No. 3. Fig. 3.



No. 4. Fig. 4.



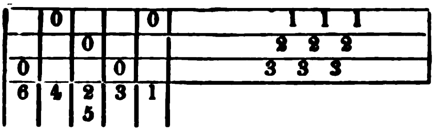
No. 5. Fig. 5.



In the plan No. 1, the two leaves A and B are for plain texture, and the additional leaves C, D, E, F, form, respectively, the plans of the three, four, five, and six leafed tweels. The corresponding figures 1, 2, 3, 4, 5, plate II. show the intervals of these textures, and the relation which they have to each other.

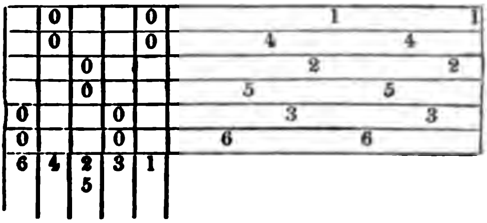
Notwithstanding the general directions given in the preceding chapter relative to the arrangement of treadles, there are some particular cases to which these instructions will not apply. These will be occasionally taken notice of as they occur in the course of the work. In the three leafed tweel, for instance, when woven with three treadles, the weaver must work them all with one foot, to avoid crossing his legs in an awkward manner; but when five treadles are employed, he can use his feet alternately without embarrassment, as will appear by the annexed plan.

No. 6.



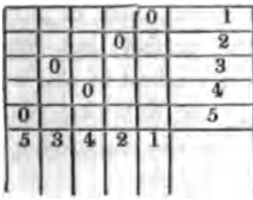
The following is a plan of the same tweel woven with six leaves, which is employed in some species of English manufacture.

No. 7.

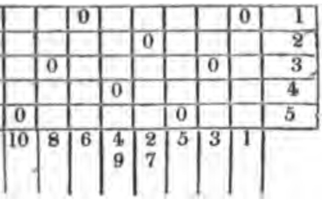


The five leafed tweel is sometimes woven with one foot, and sometimes with both, though only five treadles are employed; but to make the treading of the feet alternate without interruption, eight treadles are necessary, as under.

No. 8.



No. 9.



In working No. 8, the weaver presses down the treadle 1 with his right foot; and, as it rises, he shifts the toe of the same foot upon the treadle 2, which he next presses down: then he works treadle 3 with his left foot, treadle 4 with his right, and treadle 5 with his left; consequently, he is ready to place his right foot again on treadle 1 without crossing his legs. This method of treading is frequent in working velveteen patterns; and the weaver is said to hop with his right or left foot, according to the side on which the two successive treadles are placed. With eight treadles, however, the weaver can employ his feet alternately without interruption, as marked in No. 9.

Regular tweels are chiefly employed when a variety of colours are to be displayed, and in such fanciful patterns as are formed by the tweel reversed.

SECT. II. BROKEN OR SATIN TWEELS.

In the regular tweels, the flushing has the appearance of a series of small diagonal or oblique stripes on the cloth; but when the succession of treading or plan of cording is changed, so as to raise the leaves at intervals of one, two, or more from each other, the tweel is said to be broken; and the flushing no longer runs obliquely, but is variously chequered, according to the disposition of the raising cords, or the order of treading.

It is to be observed of satin tweels, that some are perfect in respect to the intervals at which the leaves can be raised, and others are imperfect. When the leaves can be raised regularly, at intervals of one, two, or more from each other, the tweel is said to be perfect; but imperfect, when the number of leaves does not admit of this arrangement. This will be illustrated by the following plans and observations. The lowest tweel that can be broken is that of four leaves, which is usually called the

SATINET TWEEL.

No. 10. Fig. 6.

Straight. Draught. Alternate.

			0	1				0	1
	0			2			0		3
		0		3		0			2
0				4	0				4
4	3	2	1		4	3	2	1	

FIVE LEAFED SATIN TWEELS.

Fig. 7.

No. 11. No. 12.

		0			1					0	1
				0	2			0			2
	0				3	0					3
			0		4				0		4
0					5		0				5
5	4	3	2	1		5	4	3	2	1	

No. 13.

	0				1
				0	2
		0			3
0					4
			0		5
5	4	3	2	1	

SIX AND SEVEN LEAFED TWEELS.

No. 14. Fig. 8.

					0	1
		0				2
				0		3
	0					4
			0			5
0						6
6	5	4	3	2	1	

No. 15. Fig. 9.

						0	1
		0					2
					0		3
	0						4
				0			5
0							6
			0				7
7	6	5	4	3	2	1	

EIGHT AND NINE LEAFED TWEELS.

Fig. 10. No. 16.

		0						1
							0	2
				0				3
	0							4
						0		5
			0					6
0								7
					0			8
8	7	6	5	4	3	2	1	

No. 17.

0									1
				0					2
								0	3
			0						4
							0		5
		0							6
						0			7
	0								8
					0				9
9	8	7	6	5	4	3	2	1	

SIXTEEN LEAFED SATIN TWEEL.

No. 18.

															0	1
		0														2
					0											3
								0								4
											0					5
														0		6
	0															7
				0												8
							0									9
										0						10
													0			11
0														0		12
			0													13
						0							0			14
									0							15
												0				16
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	

In these plans the treadles are arranged in their natural or progressive order, to point out more distinctly, by the raising marks, the intervals at which the leaves are raised. In the satinet straight draught, for instance, the raising cord for the first treadle is on the back leaf 1. The leaf 2 is passed, and another raising mark is placed on the leaf 3. The leaves 4 and 1 are next passed, and the third raising mark is placed on the leaf 2. The leaf 3 is now passed, and the fourth raising mark is placed on the fourth leaf. It now appears that, in course of tying up these treadles there must be two leaves passed over between cording the treadles 2 and 3, and that none can be sunk between 4 and 1: consequently, in this mounting, the leaves cannot be raised at equal intervals; and, therefore, it is one of the imperfect tweels. Among the five leafed tweels No. 11 will be found to raise each alternate leaf throughout the whole pattern; and that Nos. 12 and 13 pass two and raise the third without interruption; consequently, the five leafed tweel is perfect by each of these methods of cording. The six leafed tweel is subject to imperfections similar to that of four leaves; but the seven leafed tweel is perfect, either by passing one or two leaves, as in the five leafed tweel. Eight leaves make the tweel perfect by passing two, and raising the third; and this is the lowest perfect tweel that can be woven with an even number of leaves. The nine leafed tweel is perfect by raising each alternate leaf. Ten and eleven leaves admit of every third leaf being raised without interruption; and also, the eleven leafed tweel may be broken, by raising every second leaf; but twelve leaves make an imperfect tweel. Thirteen leaves make the tweel perfect, by raising either every second or every third leaf: fourteen perfect, by raising every third. In the fifteen leafed tweel, either one or three leaves may be passed; and, in that of sixteen, which is frequently employed in weaving some kinds of fine silks, either two or four may be passed, and the third or fifth raised.

From this general view of the regular and broken tweels, it may be observed, that any odd number of leaves above five will require an inconvenient number of treadles to allow the weaver to work them with both feet; they are, therefore, usually wrought with one. The three leafed tweel is extensively employed in weaving stout fabrics, such as blankets, fustians, &c. The four leafed biassed tweel is usually appropriated to the imitation harness work, diaper, and several species of silk. The four leafed broken tweel, beside the purpose already mentioned, is much used in the coarser kinds of diaper, called dornick. The five leafed satin tweels, of which No. 18 is usually selected, is applied to diaper and the coarser setts of damask; and the eight leafed broken tweel is appropriated to the finer kinds of damask and Canton crapes. It may be farther remarked, that all tweel mountings of an odd number of leaves, except that of three, which does not admit of being broken, will produce perfect tweels, it being among the even numbers that imperfections are found. The effect of a few of these tweels on design paper, will be seen by referring to the figures in the plate.

SECT. III. FANCY TWEELS.

In all the preceding tweels, whether regular or broken, only one leaf is raised by each treadle, all the others being sunk; by which means the greater part of the weft is thrown to one side of the cloth, and of the warp to the other. Of what are here denominated fancy tweels any number of leaves may be raised at pleasure, and a variety of flushing interspersed with plain texture, produced, in proportion to the extent of the mounting, and the order in which the leaves are raised.

The lowest of these tweels that occurs is that of four leaves, or double jean, formerly noticed. This mounting admits of no more than three varieties in tweeling, namely, the regular or biassed tweel, the broken or satinet tweel, and the double jean or serge tweel, in which two leaves are raised and two sunk by each treadle: for, were any other arrangement made of the cording, it would only change one or other of these tweels to the opposite side of the cloth. As this mounting, however, is very much employed, as well for plain as for tweeled fabrics, it may be of use to subjoin plans of the cordings which produce these textures, both when the draught is straight over the leaves, and when it is alternate.

No. 19, Fig. 11.

	0			0		0	1
0				0	0		2
	0		0		0		3
0			0			0	4
2	1		4	2	3	1	

Plain.

Tweel.

No. 20.

	0			0		0	1
	0		0		0		3
0				0	0		2
0			0			0	4
2	1		4	2	3	1	

Plain.

Tweel.

In No. 19, the warp is drawn in regular succession over the leaves, and the cording of the tweel is adapted to practice. As plain fabrics are generally woven with four leaves instead of two, to prevent the heddles from being too much crowded together, the warp is commonly drawn on alternate leaves, as in No. 20. The following examples will show how an endless variety of pattern may be produced in fancy tweeling, the number of leaves is increased, and the plan of cording varied. As the eight and ten leafed tweels are in frequent use, both in the cotton and silk manufactures, some of their principal varieties are subjoined. In those of eight leaves both the pattern and treading plans of cording are given, which will serve to illustrate the observations formerly made on the subject. Under the word pattern the cording exhibits one complete set of the tweel, and under treading will be found different methods of arranging the treadles. To show the effect of any of these plans on design paper, it is only necessary to fill a correspondent number of squares, equal to the number of squares in the cording plan; and by repeating the plan on each side, both the run of the pattern, and the joinings will be exhibited. This will be obvious, by comparing the few examples on design paper with their respective cordings. It may further be observed, that varieties may be produced as long as the raising marks are fewest in number on the treadles; but when they exceed the sinking ones, the pattern resulting has every chance to be the same as some of the preceding ones thrown to the opposite side of the cloth.

FIVE LEAFED FANCY TWEELS.

No. 21. Fig. 12. **No. 22. Fig. 13.**

			0	0	1	0			0		1
		0	0		2			0		0	2
	0	0			3		0		0		3
0	0				4	0		0			4
0				0	5		0			0	5
5	4	3	2	1		5	4	3	2	1	

SIX LEAFED FANCY TWEELS.

No. 23. Fig. 14. **No. 24. Fig. 15.**

0				0	0	1	0				0	
			0	0	0	2				0		0
		0	0	0		3			0		0	
	0	0	0			4		0		0		
0	0	0				5	0		0			
0	0				0	6		0				0
6	5	4	3	2	1		6	5	4	3	2	1

No. 25. **No. 26. Fig. 16.**

				0	0	1		0			0	0
			0	0		2	0			0	0	
		0	0			3			0	0		0
	0	0				4		0	0		0	
0	0					5	0	0		0		
0					0	6	0		0			0
6	5	4	3	2	1		6	5	4	3	2	1

SEVEN LEAFED FANCY TWEELS.

No. 27. **No. 28.**

0					0	0	1	0					0	
				0	0	0	2					0		0
			0	0	0		3				0		0	
		0	0	0			4			0		0		
	0	0	0				5		0		0			
0	0	0					6	0		0				
0	0					0	7		0					0
7	6	5	4	3	2	1		7	6	5	4	3	2	1

No. 29. No. 30.

	0				0	0	1			0			0	0
0				0	0		2		0			0	0	
			0	0		0	3	0			0	0		
		0	0		0		4			0	0			0
	0	0		0			5		0	0			0	
0	0		0				6	0	0			0		
0		0				0	7	0			0			0
7	6	5	4	3	2	1		7	6	5	4	3	2	1

EIGHT LEAFED FANCY TWEELS.

No. 31. Fig. 17.

PATTERN.									TREADING.							
0			0			0	0	1	0			0	0		0	
		0			0	0	0	2		0		0	0	0		
	0			0	0	0		3			0	0		0		0
0			0	0	0			4	0		0			0	0	
		0	0	0			0	5		0	0		0		0	
	0	0	0			0		6		0		0			0	0
0	0	0			0			7	0	0				0		0
0	0			0			0	8	0		0		0			0
8	7	6	5	4	3	2	1		8	6	4	2	1	3	5	7

No. 32. Fig. 18.

	0				0	0	0	1				0	0	0		0
0				0	0	0		2	0		0	0		0		
			0	0	0		0	3			0		0	0	0	
		0	0	0		0		4		0	0	0			0	
	0	0	0		0			5		0				0	0	0
0	0	0		0				6	0	0	0					0
0	0		0				0	7	0				0		0	0
0		0				0	0	8	0	0		0	0			
8	7	6	5	4	3	2	1		8	6	4	2	1	3	5	7

No. 33.

0						0		1	0			0				
					0		0	2							0	0
				0		0		3			0	0				
			0		0			4						0	0	
		0		0				5		0	0					
	0		0					6					0	0		
0		0						7	0	0						
	0						0	8					0			0
8	7	6	5	4	3	2	1		8	6	4	2	7	5	3	1

No. 34.

	0				0		0	1					0		0	0
0				0		0		2	0		0	0				
			0		0		0	3						0	0	0
		0		0		0		4		0	0	0				
	0		0		0			5					0	0	0	
0		0		0				6	0	0	0					
	0		0				0	7					0	0		0
0		0				0		8	0	0		0				
8	7	6	5	4	3	2	1		8	6	4	2	7	5	3	1

No. 35.

	0					0	0	1	0				0			0
0					0	0		2	0			0			0	
				0	0		0	3		0					0	0
			0	0		0		4	0	0				0		
		0	0		0			5			0			0	0	
	0	0		0				6		0	0		0			
0	0		0					7				0	0	0		
0		0					0	8			0	0				0
8	7	6	5	4	3	2	1		2	4	6	8	7	5	3	1

No. 36.

0			0				0	1				0		0		0
		0				0	0	2	0		0					0
	0				0	0		3	0				0		0	
0				0	0			4		0		0			0	
			0	0			0	5		0				0		0
		0	0			0		6	0		0			0		
	0	0			0			7			0		0		0	
0	0			0				8		0		0	0			
8	7	6	5	4	3	2	1		2	4	6	8	7	5	3	1

TEN LEAFED FANCY TWEELS.

No. 37. Fig. 19.

	0					0		0	0	1
0					0		0	0		2
				0		0	0		0	3
			0		0	0		0		4
		0		0	0		0			5
	0		0	0		0				6
0		0	0		0					7
	0	0		0					0	8
0	0		0					0		9
0		0					0		0	10
10	9	8	7	6	5	4	3	2	1	

No. 38. Fig. 20.

	0						0		0	1
0						0		0		2
					0		0		0	3
				0		0		0		4
			0		0		0			5
		0		0		0				6
	0		0		0					7
0		0		0						8
	0		0						0	9
0		0						0		10
10	9	8	7	6	5	4	3	2	1	

No. 39. Fig. 21.

					0		0		0	1
				0		0		0	0	2
			0		0		0	0	0	3
		0		0		0	0	0	0	4
	0		0		0	0	0	0	0	5
0		0		0						6
	0		0	0					0	7
0		0	0	0				0		8
	0	0	0	0			0		0	9
0	0	0	0	0		0		0		10
10	9	8	7	6	5	4	3	2	1	

No. 40.

0								0		1
							0		0	2
						0		0		3
					0		0			4
				0		0				5
			0		0					6
		0		0						7
	0		0							8
0		0								9
	0								0	10
10	9	8	7	6	5	4	3	2	1	

No. 41.

0							0	0		1
						0	0		0	2
					0	0		0		3
				0	0		0			4
			0	0		0				5
		0	0		0					6
	0	0		0						7
0	0		0							8
0		0							0	9
	0							0	0	10
10	9	8	7	6	5	4	3	2	1	

No. 42.

0		0						0	0	1
	0						0	0	0	2
0						0	0	0		3
					0	0	0		0	4
				0	0	0		0		5
			0	0	0		0			6
		0	0	0		0				7
	0	0	0		0					8
0	0	0		0						9
0	0		0						0	10
10	9	8	7	6	5	4	3	2	1	

No. 43.

	0					0	0	0	0	1
0					0	0	0	0		2
				0	0	0	0		0	3
			0	0	0	0		0		4
		0	0	0	0		0			5
	0	0	0	0		0				6
0	0	0	0		0					7
0	0	0		0					0	8
0	0		0					0	0	9
0		0					0	0	0	10
10	9	8	7	6	5	4	3	2	1	

No. 44.

0		0				0		0	0	1
	0				0		0	0	0	2
0				0		0	0	0		3
			0		0	0	0		0	4
		0		0	0	0		0		5
	0		0	0	0		0			6
0		0	0	0		0				7
	0	0	0		0				0	8
0	0	0		0				0		9
0	0		0				0		0	10
10	9	8	7	6	5	4	3	2	1	

No. 45.

0	0						0	0		1
0						0	0		0	2
					0	0		0	0	3
				0	0		0	0		4
			0	0		0	0			5
		0	0		0	0				6
	0	0		0	0					7
0	0		0	0						8
0		0	0						0	9
	0	0						0	0	10
10	9	8	7	6	5	4	3	2	1	

No. 46.

0				0				0		1
			0				0		0	2
		0				0		0		3
	0				0		0			4
0				0		0				5
			0		0				0	6
		0		0				0		7
	0		0				0			8
0		0				0				9
	0				0				0	10
10	9	8	7	6	5	4	3	2	1	

TWELVE LEAFED FANCY TWEELS.

No. 47. Fig. 22.

0					0			0	0	0		1
0				0				0	0		0	2
0			0					0		0	0	3
0		0		0	0	0	0		0	0	0	4
	0			0	0	0		0				5
0				0	0		0	0				6
				0		0	0	0			0	7
0	0	0	0		0	0	0	0		0		8
0	0	0		0					0			9
0	0		0	0				0				10
0		0	0	0			0					11
	0	0	0	0		0		0	0	0	0	12
12	11	10	9	8	7	6	5	4	3	2	1	

No. 48.

						0		0	0		0	1
					0		0	0		0	0	2
				0		0	0		0	0	0	3
			0		0	0		0	0	0	0	4
		0		0	0		0					5
	0		0	0		0	0					6
0		0	0		0	0	0					7
	0	0		0	0	0	0				0	8
0	0		0							0		9
0		0	0						0		0	10
	0	0	0					0		0	0	11
0	0	0	0				0		0	0		12
12	11	10	9	8	7	6	5	4	3	2	1	

All the running tweels may be converted into waved patterns, merely by working over the treadles from side to side, alternately, or in a zig-zag manner, and the waved stripes thus formed will run by the length of the cloth. Diamond draughts, which will be explained in the next chapter, will produce waved patterns, running across the cloth, by working the treadles straight over in one direction, as in the running tweels. Other varieties will be had, by making a little variation in the draughts, as in the pillow tweel, which will be found among the following examples.

WAVE.

No. 49. Fig. 23.

			0	1
		0		2
	0			3
0				4
4	3 5 9	2 6 8	1 7	

STOCKINET.

No. 50. Fig. 24.

		0	1
	0		2
0	0		3
0		0	4
1 3	2	4	

WAVE.

No. 51. Fig. 25.

0		0			0			0	0	1
	0			0			0	0	0	2
0			0			0	0	0		3
		0			0	0	0		0	4
	0			0	0	0		0		5
0			0	0	0		0			6
		0	0	0		0			0	7
	0	0	0		0			0		8
0	0	0		0			0			9
0	0		0			0			0	10
10	9 11	8 12	7 13	6 14	5 15	4 16	3 17 &c.	2 18 20	1 19	

TWEEL FOR PILLOW CASES OR BED TICK.

Fig. 26.

No. 52

			0	1
		0		2
	0			3
0				4
4	3	2	1	
		6	5	
1	2	3	4	
5	6			

No. 53.

			0	10 5 1
		0		9 6 2
	0			12 8 3
0				11 7 4
4	3	2	1	

HERRING BONE.

No. 54. Fig. 27.

0			0	10 5 1
	0		0	9 6 2
	0	0		12 8 3
0		0		11 4
4	2	3	1	

Fig. 28.

No. 55.

			0	1
		0		2
	0			3
0				4
4	3	2	1	
			5	
6	7	8	9	
10				

No. 56.

			0	5 1
		0		7 3
	0			8 6
0				4 2
4	2	3	1	

No. 57. Figs. 29 and 30.

			0	0	0	11 5
		0	0	0		12 10 6 4
	0	0	0			15 13 9 7 3 1
0	0	0				14 8 2
6	5	4	3	2	1	*Treading of Fig.* 29.
4	5	6	3	2	1	*Treading of Fig.* 30.

SECT. IV. TURNED OR REVERSED TWEELING.

In all the regular and broken tweels, the greatest proportion of the weft is thrown to one side of the cloth, and of the warp to the other. In a five leafed tweel, for example, if the warp were one colour and the weft another, and as there is always one leaf raised and four sunk, it will follow, that four-fifths of the weft will appear on the upper side of the cloth, and of the warp, below. But were the plan of this cording reversed, four-fifths of the warp would be thrown to the upper side, and of the weft below. Changing the appearance by the weft from one side of the cloth to the other in this manner, is called *turning or reversing* the tweel, and is of very extensive application in different branches of weaving, particularly dimities, diaper, and damask, which will be explained in their proper places.

Suppose, therefore, that a piece of cloth were to be woven in tweeled stripes, one stripe the reverse of the other, two setts of tweeling leaves would be necessary; and the plans of cording, on the treadles, would also be the reverse of each other. The first of these tweels, in respect to the number of leaves, is the dimity cord, which is merely the three leafed tweel turned, a plan of which is subjoined, both for cording and treading.

DIMITY CORD.

No. 58.

Cording.				Treading.				
		0	1 1 1		0			0
	0		2 2 2			0		
0			3 3 3	0			0	
	0	0	1 1 1		0	0		0
0		0	2 2 2	0	0		0	0
0	0		3 3 3	0		0	0	
3	2	1		6	4	2 5	3	1

In the above plan the first nine threads of warp are drawn on the back set of leaves, and the other nine on the front set. Under the word cording, the raising marks are so placed on the back leaves as to flush the weft on the upper side of the cloth, and on the front leaves, to throw up the warp. In the right hand plan, the cording is adapted to practice, which, as formerly observed, requires five treadles to make the treading alternate. The patterns, in these fabrics, are formed and regulated entirely by the quantity of warp drawn on each set of the leaves.

PLANS OF THE REGULAR AND BROKEN TWEELS, REVERSED.

No. 59.

Regular. **Satinet or Broken Tweel**

			0	1 1 1				0	
		0		2 2 2		0			
	0			3 3 3			0		
0				4 4 4	0				
	0	0	0	1 1 1		0	0	0	
0		0	0	2 2 2	0	0		0	
0	0		0	3 3 3	0		0	0	
0	0	0		4 4 4	0	0	0		
4	3	2	1		4	3	2	1	

FIVE LEAFED REGULAR AND BROKEN TWEEL STRIPES.

No. 60.

Regular. **Broken.**

				0	1 1 1		0			
			0		2 2 2					0
		0			3 3 3			0		
	0				4 4 4	0				
0					5 5 5				0	
	0	0	0	0	1 1 1	0	0	0		0
0		0	0	0	2 2 2		0	0	0	0
0	0		0	0	3 3 3	0	0		0	0
0	0	0		0	4 4 4	0	0	0	0	
0	0	0	0		5 5 5	0		0	0	0
5	4	3	2	1		5	4	3	2	1

These examples will sufficiently show the nature of turned tweel stripes: and the varieties may be increased at pleasure, by additional leaves, and by varying the size of one or both stripes.

But to convert tweeled stripes into checkers, or alternate squares, another set of treadles is necessary, in order to throw the flushing of each stripe from one side of the cloth to the other. The following plans will show, by inspection, how this is effected.

FOUR LEAFED TWEEL DAMBOARD.

No. 61. Fig. 1. *Plate* 4.

	0	0	0				0		1 1 1 1 1
0		0	0			0			2 2 2 2 2
0	0		0		0				3 3 3 3 3
0	0	0		0					4 4 4 4 4
			0		0	0	0	1 1 1 1 1	
		0		0		0	0	2 2 2 2 2	
	0			0	0		0	3 3 3 3 3	
0				0	0	0		4 4 4 4 4	
				4	3	2	1		
4	3	2	1						
	B					A			

Here it will be observed, that if the treadles at A be wrought four times over, or equal to the number of draughts in each space or stripe; and again, the treadles at B, as often, it will be obvious that two rows of squares will be produced, one row the reverse of, and bosoming with the other; and by repeating this operation, the pattern will assume the appearance of a checker board, or, as it is commonly termed, a tweel damboard.

DICED SATINET.

No. 62.

	0	0	0				0	1 1 1 1
0	0		0		0			2 2 2 2
0		0	0			0		3 3 3 3
0	0	0		0				4 4 4 4
			0		0	0	0	1 1 1 1
	0			0	0		0	2 2 2 2
		0		0		0	0	3 3 3 3
0				0	0	0		4 4 4 4
				4	3	2	1	
4	3	2	1					

FIVE LEAFED REGULAR TWEEL DAMBOARD.

No. 63.

	0	0	0	0					0	1 1 1
0		0	0	0				0		2 2 2
0	0		0	0			0			3 3 3
0	0	0		0		0				4 4 4
0	0	0	0		0					5 5 5
				0		0	0	0	0	1 1 1
			0		0		0	0	0	2 2 2
		0			0	0		0	0	3 3 3
	0				0	0	0		0	4 4 4
0					0	0	0	0		5 5 5
					5	4	3	2	1	
5	4	3	2	1						

FIVE LEAFED BROKEN TWEEL DAMBOARD.

No. 64.

0	0	0		0		0				1 1 1
	0	0	0	0					0	2 2 2
0	0		0	0			0			3 3 3
0	0	0	0		0					4 4 4
0		0	0	0				0		5 5 5
	0				0	0	0		0	1 1 1
				0		0	0	0	0	2 2 2
		0			0	0		0	0	3 3 3
0					0	0	0	0		4 4 4
			0		0		0	0	0	5 5 5
					5	4	3	2	1	
5	4	3	2	1						

In making plans of cording for reversed tweeling, of which considerable variety may be produced, particular care must be taken to avoid placing the raising marks of the different sets or divisions close together at the joinings: for, were this not attended to, part of the flushing of one division might be extended over another; by which the lines that divide the parts would not be distinctly defined; or, in the language of diaper weavers, the divisions would not *cut*. This will be better understood by comparing the following plan, with No. 61 above, in which it will be observed, that there is a raising mark on treadle 1, right hand set, for the back leaf of the front mounting, placed immediately contiguous to the raising marks on the back set, which continues the flushing of the back division into the front one, making an unevenly side similar to the teething of paper spots. And if the same figure be inspected with attention, it will be found that there is no possible way in which these divisions can be joined, but the flushing of one division will run into the other, both by the warp and weft. The most simple rule to find if these cordings be correct, is to fold one division over the other in both directions; and if the raising marks in one compartment or division, fall exactly on the sinking marks of the other, this imperfection will be avoided.

No. 65.

			0	0	0	0			1 1 1
		0		0	0		0		2 2 2
	0			0		0	0		3 3 3
0					0	0	0		4 4 4
0	0	0					0	1 1 1	
0	0		0			0		2 2 2	
0		0	0		0			3 3 3	
	0	0	0	0				4 4 4	
4	3	2	1	4	3	2	1		

CHAP. III.

LINED WORK.

SECT. I.

FROM the preceding examples of fancy tweeling, the transition to lined work is short and easy. Instead of the straight, or over and over draughts of the former, lined work patterns are usually woven with what is termed a diamond draught: that is, a draught which runs straight over the leaves from the back to the front, but returns, in the same order, to the back leaf again for one sett of the pattern; forming a zig-zag figure on the upper edges of the shafts. Sometimes, however, patterns of this kind are woven in more complex draughts, which will be explained in the sequel. The treadles, also, when placed in their natural or progressive order, are wrought from side to side alternately, in the very same order of succession as the draught.

Whatever variety, therefore, is adopted in the cording plan, one sett of the pattern will, by the preceding arrangement, be nearly double the extent by the warp, of that produced by a single draught; but the additional part will be inverted. And as the treadles are also twice wrought over, the figure will again be nearly doubled by the weft; the latter part, which is formed by returning back over the treadles, being likewise inverted: so that a square or diamond figure is commonly produced, each side of which is equal to the plan of the raising marks on the treadles. These patterns would be exactly four times the dimensions of those arising from the single draught, were two threads of warp drawn upon each leaf throughout the pattern; but, in general, those patterns turn upon a single thread at the points, both in the warp and weft; so that there is only one thread drawn on the back leaf, and one on the front leaf, while there are two on each of the intermediate ones. The same is to be observed of the treading, which will be obvious from the following examples.

The smaller mountings of this kind produce but a very limited variety of patterns, commonly a small diamond or lozenge figure, with a dot or speck in the centre, which gives it the resemblance of an eye: hence these figures are generally denominated bird-eye patterns. When the mountings, however, extend to eight leaves and upwards, they admit of considerable diversity in flushing, tweeling, and plain texture, deviating from the formal figures of the bird-eye, and which now assume the appearance of what is called lined work. No. 26, fig. 8, is an example on which the blank squares represent raising cords.

BIRD-EYE PATTERNS.

No. 1. No. 2.

Plate 2.

Fig. 31. Fig. 32.

0			0	1 1			0	0
		0		6 2 6 2		0	0	
	0			5 3 6 3	0	0		
0				4 4	0			0
4	3 5	2 6	1		4	3 5	2 6	1

No. 3. No. 4.

Fig. 33. Fig. 34.

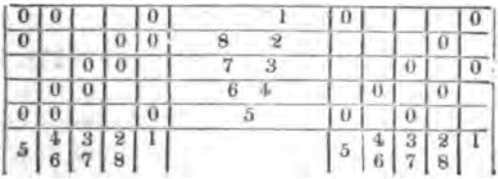
0	0			0	1 1				0	
0			0		8 2 8 2			0		0
		0			7 3 7 3		0		0	
	0			0	6 4 6 4	0		0		
0			0	0	5 5		0			
5	4 6	3 7	2 8	1		5	4 6	3 7	2 8	1

No. 5.

Fig. 35.

No. 6.

Fig. 36.

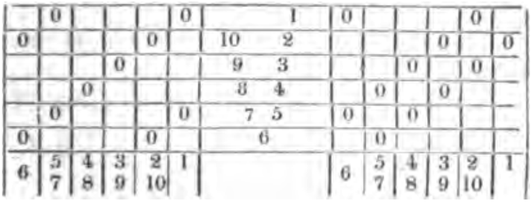


No. 7.

Fig. 37.

No. 8.

Fig. 38.

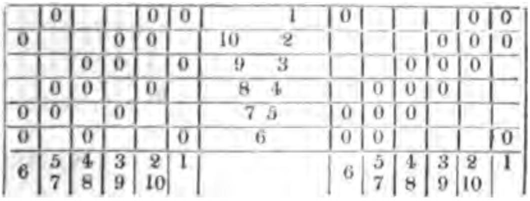


No. 9.

Fig. 39.

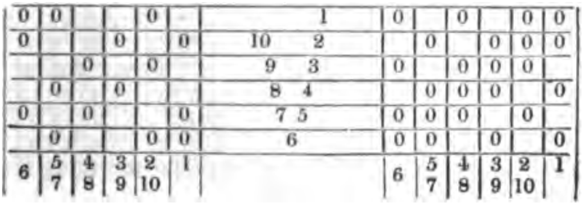
No. 10.

Fig. 40.



No. 11.

No. 12.



LINED WORK PATTERNS.

No. 13.

No. 14.

Plate 3.

Fig. 1.

Fig. 2.

	0		0			0	0	1	0			0			0	0
0		0			0	0	0	14 2		0				0	0	0
	0			0	0	0		13 3			0		0	0	0	
0			0	0	0			12 4	0			0	0	0		
		0	0	0			0	11 5			0	0	0			0
	0	0	0			0	0	10 6		0	0	0		0		
0	0	0			0	0	0	9 7	0	0	0				0	
0	0			0	0	0		8	0	0			0			0
8	7 9	6 10	5 11	4 12	3 13	2 14	1		8	7 9	6 10	5 11	4 12	3 13	2 14	1

No. 15.

No. 16.

Fig. 3.

Fig. 4.

0					0	0	0	1	0				0	0		
	0				0	0		14 2		0				0	0	
		0	0	0	0			13 3			0				0	0
		0	0	0				12 4				0	0	0	0	0
		0	0				0	11 5	0			0	0	0		
0	0	0				0	0	10 6	0	0		0	0	0		
0	0				0	0	0	9 7		0	0	0			0	
0				0	0	0		8			0	0				0
8	7 9	6 10	5 11	4 12	3 13	2 14	1		8	7 9	6 10	5 11	4 12	3 13	2 14	1

No. 17.

No. 18.

0	0				0		0	1	0	0	0				0	0
0				0		0		14 2	0	0				0	0	
			0		0		0	13 3	0				0	0		0
		0		0		0		12 4				0	0		0	0
	0		0		0			11 5			0	0		0	0	
0		0		0				10 6		0	0		0	0		
	0		0				0	9 7	0	0		0	0			0
0		0				0		8	0		0	0			0	
8	7 9	6 10	5 11	4 12	3 13	2 14	1		8	7 9	6 10	5 11	4 12	3 13	2 14	1

No. 19.

No. 20.

0			0			0		1	0					0	0	
	0				0		0	14 2		0			0	0		0
		0		0		0		13 3			0	0	0		0	0
0			0		0			12 4			0	0		0	0	
		0		0				11 5		0	0		0	0		
	0		0		0	0	0	10 6	0	0		0	0			
0		0			0	0	0	9 7	0		0	0			0	0
	0				0	0		8		0	0				0	0
8	7 9	6 10	5 11	4 12	3 13	2 14	1		8	7 9	6 10	5 11	4 12	3 13	2 14	1

No. 21.

No. 22.

0	0	0				0	0	1	0	0		0			0	0
0	0	0			0	0	0	14 2	0		0			0	0	
0	0	0		0	0	0		13 3		0			0	0		
			0	0	0			12 4	0			0	0			
		0	0	0			0	11 5			0	0		0	0	0
	0	0	0			0	0	10 6		0	0		0		0	0
0	0	0			0	0	0	9 7	0	0			0	0		0
0	0			0	0	0		8	0				0	0	0	
8	7 9	6 10	5 11	4 12	3 13	2 14	1		8	7 9	6 10	5 11	4 12	3 13	2 14	1

No. 23. Fig. 5.

0							0	0		1
	0					0	0		0	18 2
		0	0	0	0	0		0	0	17 3
		0	0	0	0		0	0		16 4
		0	0	0		0	0			15 5
		0	0		0	0			0	14 6
	0	0		0	0			0	0	13 7
0	0		0	0			0	0		12 8
0		0	0			0	0			11 9
	0	0			0	0			0	10
10	9 11	8 12	7 13	6 14	5 15	4 16	3 17	2 18	1	

No. 24. Fig. 6.

0			0	0	0			0	0	1
	0			0			0	0		18 2
		0				0	0			17 3
0			0		0	0			0	16 4
0	0			0	0		0			15 5
0			0	0				0		14 6
		0	0					0	0	13 7
	0	0		0			0	0		12 8
0	0				0	0	0			11 9
0			0			0			0	10
10	9 11	8 12	7 13	6 14	5 15	4 16	3 17	2 18	1	

No. 25. Fig. 7.

	0	0	0				0		0	1
0	0	0				0		0	0	18 2
0	0				0		0	0	0	17 3
0				0		0	0	0	0	16 4
			0		0	0	0	0	0	15 5
		0		0						14 6
	0		0	0		0				13 7
0		0	0	0			0			12 8
	0	0	0	0				0		11 9
0	0	0	0	0					0	10
10	9 11	8 12	7 13	6 14	5 15	4 16	3 17	2 18	1	

No. 26. Fig. 8.

0				0	0				0	1
	0				0	0		0	0	18 2
		0				0	0	0	0	17 3
			0	0	0	0	0	0	0	16 4
0			0	0	0	0	0	0		15 5
0	0		0	0	0	0	0			14 6
	0	0	0	0	0	0			0	13 7
		0	0	0	0			0	0	12 8
	0	0	0	0			0	0		11 9
0	0	0	0			0	0			10
10	9 11	8 12	7 13	6 14	5 15	4 16	3 17	2 18	1	

No. 27.

0		0		0				0	0		1
	0		0				0	0		18	2
0		0				0	0			17	3
	0				0	0				16	4
0				0	0				0	15	5
			0	0				0	0	14	6
		0	0				0	0		13	7
	0	0				0	0			12	8
0	0				0	0		0		11	9
0				0	0				0	10	
10	9 11	8 12	7 13	6 14	5 15	4 16	3 17	2 18	1		

No. 28

		0	0			0	0				1
		0	0			0	0			18	2
0	0								0	17	3
0	0							0		16	4
				0	0				0	15	5
				0	0			0		14	6
0	0						0		0	13	7
0	0					0		0		12	8
			0		0		0		0	11	9
		0		0		0		0		10	
10	9 11	8 12	7 13	6 14	5 15	4 16	3 17	2 18	1		

No. 29.

0							0	0	0		1
	0						0	0		18	2
		0	0	0	0	0	0			17	3
		0	0	0	0	0			0	16	4
		0	0	0	0			0	0	15	5
		0	0	0			0	0		14	6
		0	0			0	0		0	13	7
	0	0			0	0		0		12	8
0	0			0	0		0		0	11	9
0			0	0		0		0		10	
10	9 11	8 12	7 13	6 14	5 15	4 16	3 17	2 18	1		

No. 30.

	0	0	0	0				0	0	1
0		0	0	0			0		0	18 2
0	0		0	0		0				17 3
0	0	0		0	0				0	16 4
0	0	0	0	0				0		15 5
			0		0		0		0	14 6
		0				0		0		13 7
	0				0		0		0	12 8
0				0		0		0		11 9
0	0		0		0		0		0	10
10	9 11	8 12	7 13	6 14	5 15	4 16	3 17	2 18	1	

TWELVE LEAFED PATTERNS.

No. 31.

Fig. 9.

			0	0	0					0	0	1
			0	0					0	0	0	22 2
			0		0	0	0	0	0	0		21 3
0	0	0			0	0	0	0	0			20 4
0	0				0	0	0	0			0	19 5
0		0	0	0	0		0		0			18 6
		0	0	0	0	0				0		17 7
		0	0	0	0		0				0	16 8
		0	0	0				0				15 9
	0	0	0		0				0			14 10
0	0	0				0				0		13 11
0	0			0			0				0	12
12	11 13	10 14	9 15	8 16	7 17	6 18	5 19	4 20	3 21	2 22	1	

No. 32.

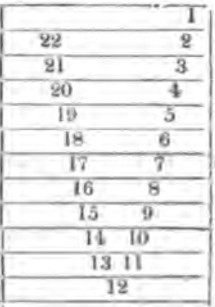
Fig. 10.

	0	0	0			0		0		0		1
0	0	0			0		0		0			22 2
0	0			0		0		0			0	21 3
0			0		0		0			0	0	20 4
		0		0		0			0	0		19 5
	0		0		0					0	0	18 6
0		0		0							0	17 7
	0		0				0	0				16 8
0		0					0	0				15 9
	0			0							0	14 10
0			0	0	0					0	0	13 11
		0	0		0	0			0	0		12
12	11 13	10 14	9 15	8 16	7 17	6 18	5 19	4 20	3 21	2 22	1	

No. 33.

0			0	0	0	0	0			0	
	0			0	0	0			0		0
		0			0			0		0	
0			0				0		0		
0	0			0		0		0			0
0	0	0			0		0			0	0
0	0			0		0			0	0	0
0			0		0			0	0	0	
		0		0			0		0	0	0
	0		0			0	0	0		0	0
0		0			0	0	0	0	0		0
	0			0	0	0		0	0	0	
12	11 13	10 14	9 15	8 16	7 17	6 18	5 19	4 20	3 21	2 22	1

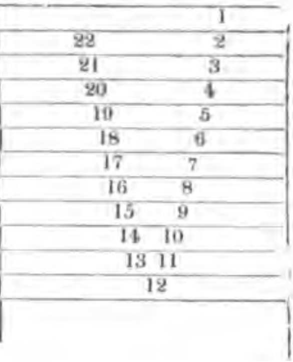
Fig. 11.



No. 34.

	0				0		0				0
0		0				0				0	0
	0		0						0	0	0
		0		0				0	0	0	0
			0		0		0	0	0	0	0
0				0		0	0	0			
	0				0	0	0	0			
0				0	0	0	0	0			
			0	0	0	0	0	0			
		0	0	0					0	0	0
	0	0	0	0					0	0	0
0	0	0	0	0					0	0	0
12	11 13	10 13	9 15	8 16	7 17	6 18	5 19	4 20	3 21	2 22	1

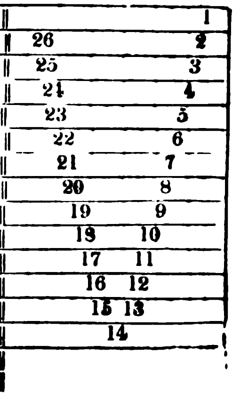
Fig. 12.



FOURTEEN LEAFED PATTERNS.

No. 35. Fig. 13.

	0	0			0	0	0	0		0			0
0	0			0	0	0		0	0		0		
0			0	0	0				0	0		0	
		0	0	0				0		0	0		0
	0	0	0	0	0	0	0				0	0	
0	0	0		0			0			0	0		0
0	0			0			0		0	0		0	
0				0	0	0	0	0	0		0		0
0	0		0				0	0		0		0	0
	0	0				0	0		0		0	0	
0		0	0		0	0		0		0	0		
	0		0	0	0		0		0	0	0		
		0		0		0		0	0			0	
0			0		0		0	0					0
14	13 15	12 16	11 17	10 18	9 19	8 20	7 21	6 22	5 23	4 24	3 25	2 26	1



No. 36. Fig. 14.

0						0	0	0		0		0	0		1
	0						0	0	0		0	0	0	26	2
		0						0	0	0	0	0		25	3
			0						0	0	0		0	24	4
				0	0	0	0	0	0	0		0		23	5
				0	0	0	0	0	0		0		0	22	6
0				0	0	0	0	0		0		0		21	7
0	0			0	0	0	0		0		0		0	20	8
0	0	0		0	0	0		0		0		0	0	19	9
	0	0	0	0	0		0		0		0	0	0	18	10
0		0	0	0		0		0		0	0	0	0	17	11
	0	0	0		0		0		0	0	0	0	0	16	12
0	0	0		0		0		0	0	0	0	0		15	13
0	0		0		0		0	0	0	0	0		0	14	
14	13 15	12 16	11 17	10 18	9 19	8 20	7 21	6 22	5 23	4 24	3 25	2 26	1		

No. 37.

0				0	0	0				0		0	0		1
	0		0	0	0				0		0	0	0	26	2
		0	0	0				0		0	0	0		25	3
	0	0	0				0		0	0	0			24	4
0	0	0		0		0		0	0	0			0	23	5
0	0				0		0	0	0			0		22	6
0				0		0	0	0			0		0	21	7
			0		0	0	0		0			0		20	8
		0		0	0	0		0		0			0	19	9
	0		0	0	0		0		0		0			18	10
0		0	0	0				0		0		0		17	11
	0	0	0			0			0		0		0	16	12
0	0	0			0		0			0		0		15	13
0	0			0		0		0			0		0	14	
1	13 5	12 16	11 17	10 18	9 19	8 20	7 21	6 22	5 23	4 24	3 25	2 26	1		

No. 38.

	0	0	0			0	0			0			0		1
0	0	0			0	0		0				0		26	2
0	0			0	0				0		0		0	25	3
0			0	0						0		0	0	24	4
		0	0	0		0			0		0	0	0	23	5
	0	0			0			0		0	0	0		22	6
0	0			0		0	0		0	0	0		0	21	7
0						0		0	0	0		0		20	8
	0				0		0	0	0		0			19	9
		0		0		0	0	0		0				18	10
0			0		0	0	0		0				0	17	11
		0		0	0	0		0				0	0	16	12
	0		0	0	0		0				0	0	0	15	13
0		0	0	0		0				0	0	0	0	14	
14	13 15	12 16	11 17	10 18	9 19	8 20	7 21	6 22	5 23	4 24	3 25	2 26	1		

No. 39. Fig. 15.

0	0	0				0	0		0	0	0		0	0			1
0	0	0			0	0			0	0		0	0			30	2
0	0	0		0	0				0		0	0				29	3
			0	0		0	0	0		0	0					28	4
		0	0			0	0		0	0						27	5
	0	0				0		0	0							26	6
0	0		0	0	0		0	0								25	7
0			0	0		0	0		0	0	0	0	0	0	0	24	8
			0		0	0		0		0	0	0	0	0	0	23	9
0	0	0		0	0		0		0		0	0	0	0	0	22	10
0	0		0	0			0	0		0		0	0	0	0	21	11
0		0	0				0	0	0		0		0	0	0	20	12
	0	0					0	0	0	0		0		0	0	19	13
0	0						0	0	0	0	0		0		0	18	14
0							0	0	0	0	0	0		0		7	15
							0	0	0	0	0	0	0		0	16	
16	15 17	14 18	13 19	12 20	11 21	10 22	9 23	8 24	7 25	6 26	5 27	4 28	3 29	2 30	1		

No. 40.

			0		0		0	0	0		0	0				1
		0		0		0			0	0		0	0			30 2
	0		0							0	0		0	0		29 3
0		0		0							0	0		0	0	28 4
	0		0		0							0	0		0	27 5
0				0		0					0	0		0	0	26 6
	0				0		0	0		0	0		0	0		25 7
0						0		0	0	0		0	0			24 8
0						0	0	0	0		0	0				23 9
0	0						0	0		0	0					22 10
	0	0				0	0		0	0					0	21 11
0		0	0		0	0		0	0		0					20 12
0	0		0	0	0		0	0				0				19 13
	0	0		0		0	0						0			18 14
		0	0		0	0								0		17 15
			0	0	0					0					0	16
16	15 17	14 18	13 19	12 20	11 21	10 22	9 23	8 24	7 25	6 26	5 27	4 28	3 29	2 30	1	

No. 41. Fig. 16.

				0		0		0	0		0			0					0	1
			0		0		0		0	0		0	0		0					38 2
		0	0							0	0		0	0		0				37 3
	0	0		0							0	0		0	0		0			36 4
0			0		0							0	0		0	0	0	0		35 5
	0			0		0							0	0	0	0		0	0	34 6
0					0		0							0	0		0	0		33 7
	0					0		0	0		0		0	0		0	0			32 8
0							0		0	0		0	0		0	0				31 9
0	0						0	0		0	0	0		0	0					30 10
	0	0						0	0	0	0		0	0					0	29 11
0		0	0				0		0	0		0	0					0		28 12
	0		0	0				0	0		0	0					0			27 13
	0	0		0	0		0	0		0	0					0				26 14
0		0	0		0	0	0		0	0					0		0			25 15
	0		0	0	0	0		0	0					0				0		24 16
		0		0	0		0	0					0						0	23 17
			0	0		0	0					0		0				0	0	22 18
				0	0	0					0				0		0	0	0	21 19
0					0					0						0	0	0		20
20	19 21	18 22	17 23	16 24	15 25	14 26	13 27	12 28	11 29	10 30	9 31	8 32	7 33	6 34	5 35	4 36	3 37	2 38	1	

No. 42.

0				0				0	0	0	0					0	0		0	1
	0						0	0	0	0					0	0		0		38 2
		0				0	0	0	0					0	0		0		0	37 3
			0		0	0	0	0					0	0		0		0	0	36 4
0				0	0	0	0					0	0		0		0	0		35 5
			0	0	0	0					0	0		0		0	0			34 6
		0	0	0	0					0	0		0		0	0				33 7
	0	0	0	0					0	0		0		0	0		0	0	0	32 8
0	0	0	0					0	0		0		0	0			0	0	0	31 9
0	0	0					0	0		0		0	0				0	0	0	30 10
0	0					0	0		0		0	0					0	0	0	29 11
0					0	0		0		0	0						0	0	0	28 12
				0	0		0		0	0		0	0	0	0	0				27 13
			0	0		0		0	0			0	0	0	0	0				26 14
		0	0		0		0	0				0	0	0	0	0				25 15
	0	0		0		0	0					0	0	0	0	0				24 16
0	0		0		0	0						0	0	0	0	0				23 17
0		0		0	0		0	0	0	0	0						0	0	0	22 18
	0		0	0			0	0	0	0	0						0	0	0	21 19
0		0	0				0	0	0	0	0						0	0	0	20
20	19 21	18 22	17 23	16 24	15 25	14 26	13 27	12 28	11 29	10 30	9 31	8 32	7 33	6 34	5 35	4 36	3 37	2 38	1	

No. 43.

0							0	0	0	0		0			0		0	0		1
	0								0	0	0		0			0		0	0	38 2
		0								0	0	0		0			0		0	37 3
			0								0	0	0		0				0	36 4
				0								0	0	0		0		0		35 5
					0								0	0	0		0			34 6
						0							0	0		0				33 7
0							0					0	0		0					32 8
0								0	0	0	0	0		0					0	31 9
0	0							0	0	0	0		0					0	0	30 10
0	0	0						0	0	0		0					0	0		29 11
	0	0	0					0	0		0					0	0			28 12
0		0	0	0			0	0		0					0	0				27 13
	0		0	0	0	0	0		0					0	0					26 14
		0		0	0	0		0					0	0					0	25 15
0			0		0		0					0	0					0		24 16
	0			0		0					0	0					0			23 17
0		0			0					0	0					0				22 18
0	0			0					0	0					0				0	21 19
	0	0	0					0	0					0				0	0	20
20	19 21	18 22	17 23	16 24	15 25	14 26	13 27	12 28	11 29	10 30	9 31	8 32	7 33	6 34	5 35	4 36	3 37	2 38	1	

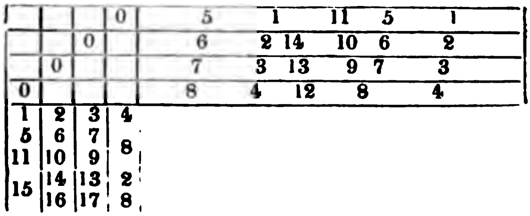
SECT. II. DOUBLE, TRIPLE, &C. DRAUGHTS.

THESE examples will be sufficient to apprise the reader, of the great variety of figures that can be woven on lined work, especially by the larger mountings. All these figures, however, are produced by the diamond draught; and, like those in fancy tweeling, arise, solely, from different arrangements of the raising cords upon the treadles. But, as the resources of fancy weaving are inexhaustible, various other changes will be effected in these figures, merely by diversifying the order or succession of the draught, independently of the position of the raising cords. As every extension of the draught in this manner, however, enlarges the figure in a duplicate proportion, that is, as the square of the number of threads in one set of the draught, such patterns, when the leaves are numerous, will occupy a considerable space on design paper; and therefore, to save room in the plate, only a few specimens, upon a small scale, can be added. These specimens, however, will sufficiently unfold the principle on which these varieties are produced, and which may be extended to the larger mountings, at pleasure.

The following figure is a plan of what is usually called a double draught, and which is only the diamond draught inverted.

DOUBLE DRAUGHT.

No. 44. Fig. 17.



The double draught, whatever plan of cording is adopted, always produces two square or diamond figures, one within the other, which are again imbosomed by others of the same kind, formed by the inverted part of the draught. The following is a plan of the double draught upon six leaves, the cording of which is the same as No. 26, in fancy tweeling, and No. 9, among the bird-eye patterns.

No. 45.

	0			0	0	17 11 1 23
0			0	0		18 16 10 2 24
		0	0		0	19 15 9 3 25
	0	0		0		20 14 8 4 26
0	0		0			21 13 7 5 27
0		0			0	22 12 6 28
6 12 22 28	5 7 13 21 27	4 8 14 20 26	3 9 15 19 25	2 10 16 18 24	1 11 17 23	

A triple draught enlarges the dimensions of these patterns still farther; producing, in general, three similar concentric figures, which are all imbosomed by others of the same kind, where the draught is inverted, as represented in fig. 18. The following is a plan of this draught on a scale of four leaves, with one leaf raised and three sunk; but it is evident from the preceding examples of lined work, that much diversity will arise here also, by varying the arrangement of the raising cords on the treadles.

TRIPLE DRAUGHT.

No. 46. Fig. 18.

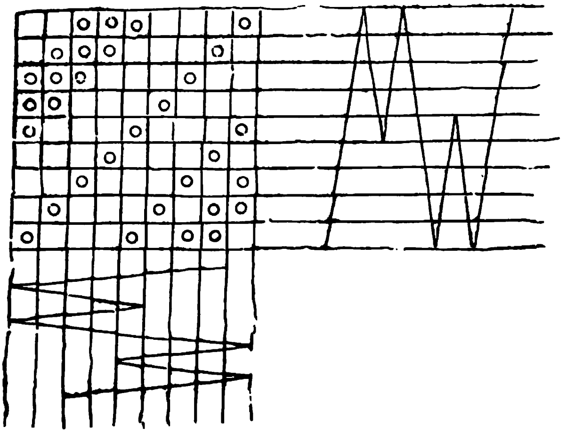
			0	1 19 15 9 5 1
		0		2 22 18 14 10 6 2
	0			3 21 17 13 11 7 3
0				4 20 16 12 8 4
1 5 9 15 19	2 6 10 14 18 22	3 7 11 13 17 21	4 8 12 16 20	

From this example it will appear, that any number of concentric figures may be formed, by repeating the draught any number of times over the leaves in one direction, and returning in the contrary direction as often: so that, should the draught diverge from the centre of the cloth toward each selvage, and the treading continued to the same extent, the pattern would be one great figure, composed of concentric squares, whose dimensions and variety would depend on the number of leaves, and the arrangement of the raising cords.

Another method of diversifying the draughts of lined work patterns, is, by dividing the leaves into two equal portions, and drawing a few sets of the diamond draught on each portion, alternately. This arrangement throws the group of small figures produced by each set of leaves, into alternate squares, somewhat resembling the damboard pattern. It is customary, however, to introduce an odd leaf into these mountings, immediately between the two divisions, which serves as a point leaf to both sets. The following plans will illustrate these remarks.

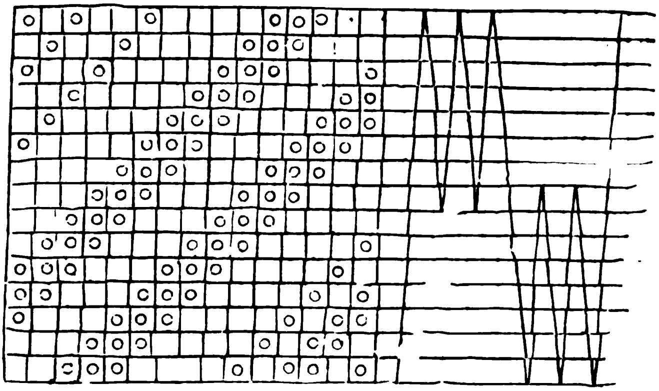
ALTERNATE DIAMOND DRAUGHTS.

No. 47. Fig. 19.

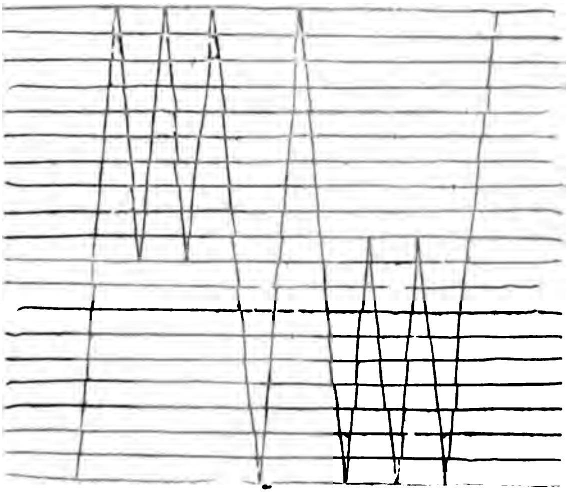


The lines drawn over the leaves and treadles of the preceding plan and two following draughts, show the succession of the draught and treading, as described in page 6.

No. 48.



No. 49. DRAUGHT.



CORDING OF No. 57.

0	0	0	0					0					0	0	0	0			
0	0	0					0					0	0	0	0				
0	0					0					0	0	0	0				0	
0					0					0	0	0	0				0	0	
				0					0	0	0	0				0	0	0	
			0					0	0	0	0				0	0	0	0	
		0					0	0	0	0				0	0	0	0		
	0					0	0	0	0				0	0	0	0			
0					0	0	0	0				0	0	0	0				
				0	0	0	0				0	0	0	0					
			0	0	0	0				0	0	0	0					0	
		0	0	0	0				0	0	0	0					0		
	0	0	0	0				0	0	0	0					0			
0	0	0	0				0	0	0	0					0				
0	0	0				0	0	0	0					0					
0	0				0	0	0	0					0					0	
0				0	0	0	0					0					0	0	
			0	0	0	0					0					0	0	0	
		0	0	0	0					0					0	0	0	0	

In all the preceding patterns, the order of the treading is the same as the draught, which, indeed, is the common practice in this branch of weaving. The treadles, however, might be wrought over in various other successions, which would give a proportionate effect to the patterns.

To find the number of leaves requisite for any lined work pattern from the cloth or design paper, count the threads or spaces from the centre of one figure to the centre of the imbosoming one, including the two points; and this will be equal to the number of leaves: and if a square be formed of which this is the diagonal, it will give a representation of the cording on the treadles, the raising marks corresponding with the black squares on the design paper.

But if a draught and cording be given to represent the pattern on design paper; first make a figure on the paper exactly the same as that formed on the treadles by the raising marks; and, this repeated four times, but inverted, so that any one corner of the cording plan may be the common centre, and allowing only one thread for each of the points, both by the warp and weft, it will give one complete set of the pattern, which will be evident by comparing any of the preceding plans with their respective Figures in the plate.

In the more complex patterns, however, if the threads of warp be numbered as in the draught, each thread will have its corresponding space on the design paper, counting from right to left. The numbers also, which point out the order of treading, will correspond with the threads of weft, which are to be counted from the bottom of the paper, upwards. Then observe what threads of warp are raised by each treadle, beginning with number one of the treading, and taking the others in their order; and these marked on the corresponding squares of the design paper, will give one set of the pattern.

Lined work patterns have hitherto been chiefly confined to table linen; but, from the great diversity of which they are susceptible, they might be also employed, with considerable advantage, in some of the branches of the cotton and silk manufactures. For instance, were the warp one colour and the weft another, they might be made into shawls, &c. in great variety.

CHAP. IV.

DORNIC AND DIAPER.

SECT. I.

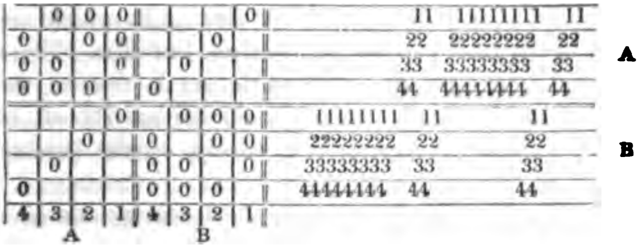
HAVING explained, in the second chapter, the method of turning or reversing the tweel, both when the run of the flushing is regular and when it is broken, we come now to apply this principle to the production of an extensive variety of fanciful patterns, which are partly known by the name of dornic, and partly, by that of diaper.

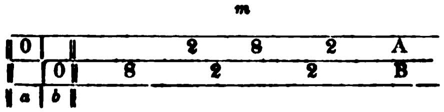
This branch of weaving was chiefly confined to the manufacture of table linens, till of late, that it has been applied to a certain species of shawls, in the cotton manufacture, the warp and woof of which are, in general, of different colours. The coarser sets of table linens, and which require the least mounting, having only a four leafed tweel, were manufactured in considerable quantities, some time ago, at Dornock, in the north of Scotland; whence the name dornic: but the finer kinds, which are usually woven by a more extensive apparatus, and, in general, with a tweel of five leaves, are called diaper. As these patterns, however, are all woven on the same principle, namely, reversing the tweel, this distinction merits no farther regard, than that the smaller mountings be first explained, and the others, in order, as they become more complex.

The most simple pattern of this kind is the damboard or checker, Fig. 1, plate 4, which has been already explained: but such draughts, instead of forming squares, may be broken into an indefinite number of parts, of various dimensions; and, when the whole of this variety contained in one set of the pattern is woven square, which is effected by following the same order of succession in treading as is observed in the draught, or any other succession which fancy may suggest, an endless diversity of figures may be produced, merely by two sets of tweeling leaves.

The following plan, which may be taken for an example, is the draught and cording of a very common pattern in this branch of weaving; and the figure which it produces is represented on design paper in Fig. 2.

No. 1. Fig. 2. Plate 4.





This draught and plan of cording are adapted to the four-leafed biassed tweel, the cording being the very same as that of the checker; but, it will be obvious from the examples given under the article, reversed tweeling, that the same figure may be produced by a tweel of any other number of leaves, and woven either by the regular or broken method of treading.

When two or more sets of tweeling leaves are thus employed, the mounting is said to consist of two or more *divisions*, and the draughts and cordings of such mountings are usually marked on one leaf and treadle for each set or division, which are sufficient to exhibit all the design. This is called the *binding plan;* because it binds, as it were, the several divisions together, which are at any time to be raised, and brings all that is essential in the pattern, into a small compass: so that the weaver has only to substitute one set of tweeling leaves and treadles, whatever number may be employed, for each leaf and treadle in this plan.

This will be apparent by comparing the preceding draught and cording with the corresponding draught, marked *m*, in which it will be observed, that, on the back set of leaves A, there are two draughts, which are marked 2 on the back leaf of *m;* then 2 over the fore set B, which are marked, in the same manner, on the front leaf of *m*. These are succeeded by eight draughts on the set A, two on the set B, two on the set A, and eight on the set B; all of which are set down in figures, respectively, on the binding plan *m*.

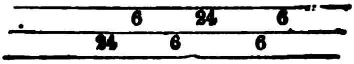
Where the four treadles A cross the leaves or divisions marked A, the greatest portion of raising marks is placed; or, that division is said to be raised, in order to reverse the tweel: a raising mark is therefore placed in the corresponding square of the binding plan, on the treadle marked *a*. The same is to be observed with respect to the leaves and treadles marked B; and this takes place in all those plans which are given in the contracted form, whatever number of divisions they may contain.

In weaving this pattern, the weaver works twice over the treadles A, because these reverse the tweel in such parts of the pattern as are drawn on the back division: and, by following the succession of the draught, he goes twice over the treadles B, eight times over the treadles A; and so on till the figure be square; after which, the same succession is repeated.

When dornic or diaper patterns are drawn on design paper, which is usually 10 by 10, each unit in the binding plan denotes one space by the warp: so that each of these spaces may contain sometimes four and sometimes five threads, according as it is intended for dornic or diaper, or fineness of the reed, and these are generally drawn through one interval of the reed. The spaces by the weft, likewise contain a corresponding number of shots, or once over the set of heddles.

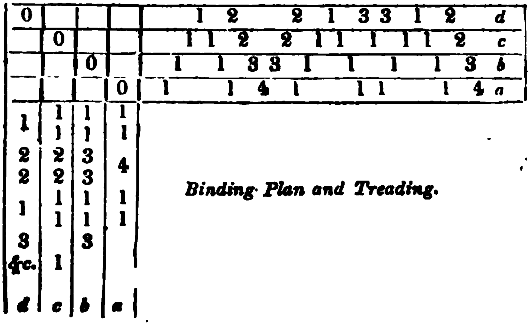
Keeping still in mind the general rule, that all patterns formed by the warp are produced by the raising cords; let the warp, in this example, be supposed blue, and the weft white; then the dark shaded spaces in the figure will represent the pattern as formed by flushing the warp above, and the white spaces, those parts of the pattern where the warp is below. Hence, the two spaces at the bottom of the design, Fig. 2, will represent those parts of the figure which are produced by working twice over the treadles A; the next two spaces, those which are produced by the treadles B. The treadles A, again being wrought eight times over, form the large squares of eight spaces each way; and so on, with any other variety that may occur, without any regard being paid to the number of tweeling leaves in the division.

It must be observed, however, that this pattern, as well as all those given in this chapter, is drawn upon a comparatively small scale; and thus, in applying them to practice, they may be enlarged in any given proportion, either to expand their dimension, or to suit them to any desirable sett of reed. Thus, were all the figures on the binding plan of the preceding pattern multiplied by 3, it would stand as below, and afford an example, in which it will appear that all the members of the draught are still in the same proportion as at first: and so of any other pattern of this kind.



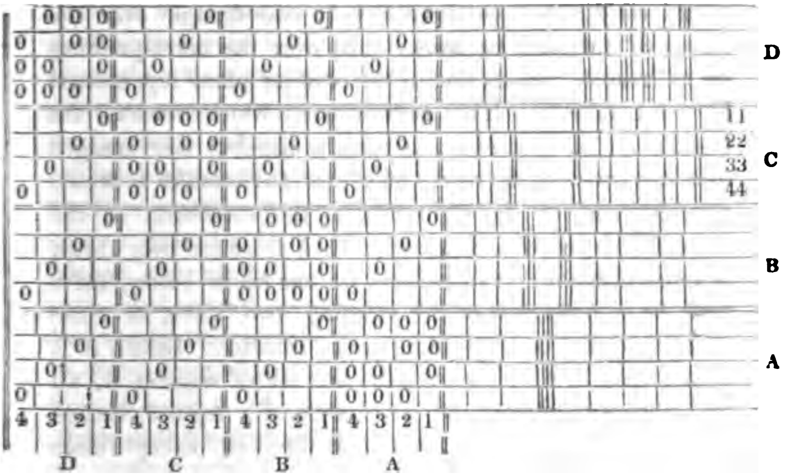
When a still greater variety of pattern is required, the number of divisions must be increased, as in the other branches of weaving. As these mountings, however, can only be augmented by adding complete sets of the tweel, the varieties arising from an increase of leaves in this, must be more limited than in almost any other branch. This disadvantage, however, is in a great measure compensated by the ingenious diversity which is usually observed in the succession of the draught; by means of which, a style of pattern peculiar to diaper weaving is produced. The same draught also will weave a variety of patterns, agreeably to the different arrangements of the raising cords upon the binding plan, and the succession of working over the treadles: and, that diaper mountings may not always be confined to their original draughts, the heddles are not, in general spaced, as in the finer kinds of fancy mountings, but are cast separately, so as to run on the backing or maitland cord; by which the weaver can adapt them, at pleasure, to any pattern he may have occasion to weave. The following plans, which are on a scale of four divisions, and only a four-leafed tweel for saving room, will give the reader an idea of the manner in which a variety of patterns may be obtained from the same draught and succession of treading, merely by a different position of the raising cords upon the treadles.

No. 2. Fig. 5.



No. 2.

THE FULL MOUNTING.



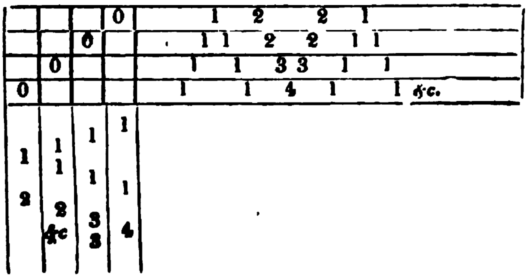
In this example, the straight lines which are drawn across the several divisions, denote the draughts over the leaves; that is, each line shows that one thread is to be drawn on each leaf of that set on which it is placed: and this method is commonly adopted when the draughts and cordings are thus extended, in preference to that of marking the succession of drawing by figures, on account of taking less room. Thus, the drawing commences on the back leaf of the division C, and is continued until it has gone twice over these leaves, as pointed out by the figures. Then there are two similar draughts on the leaves D, one on A, one on B, one on C, one on D, and so forth, agreeably to the units in the figures in the binding plan, the draught commencing always on the back leaf of each division.

By following the order of treading, which is here the same as the draught, and which is marked on the treadles of the binding plan at *a*, *b*, *c*, and *d*, the weaver observes, as in the first example, on what set or division the drawing commences or terminates, which, in this plan, terminates on the set A: then as there is only one draught over the leaves of this set, he works once over the corresponding set of treadles, which are, in the binding plan, represented by the treadle *a*. The next division which reverses the tweel is B; and therefore, as there is also but one draught over this division, he works once over the treadles *b*, which raise it; and so on, agreeably to the succession of the draught; always observing, that when there are two, three, or more draughts, in succession, on one set of leaves, there must be a repetition of the treading, two, three, or more times, over the corresponding set of treadles. Hence it is plain, that, in working over the first set of treadles A, all the cloth will exhibit the appearance of a regular biassed tweel, flushed on the upper side by the weft, except those parts of the pattern which are woven by the set of leaves marked A, in which the tweel will be reversed, or the warp flushed above. The same is to be understood of the effect produced by the other sets or divisions.

This pattern is represented on design paper at fig. 5, in which, as formerly noticed, each space from right to left contains four threads of warp, or one set of the tweel; and each space from the bottom upwards contains four shots of weft, or once over one set of the treadles. Hence, from a due consideration of this example, and the plan of treading subjoined, it will be easy to perceive how dornic or diaper patterns, in general, may be represented on design paper from the draught. For, as the figures on the leaves of the binding plan must all have corresponding spaces on the design paper, counted from right to left; so all the figures on the treadles must have their respective spaces counted upwards, to represent the weft. Suppose then, the treadles of the binding plan extended, as at *a*, *b*, *c*, *d*; and, having marked the succession of the draught upon these treadles, we will find that the treadle *a*, on which the first figure is placed, raises or reverses the division *a*, or the set of leaves A, in the full mounting: and as the first figure on this treadle is 1, it shows that, as the corresponding treadles are to be wrought only once over, all the figures on this leaf, or division, *a*, will occupy one space by the weft on the design paper. Then mark the first space at the left hand corner of the design; pass 5, for the five intervening draughts on the other three divisions; mark the seventh, pass 7; mark 4, and so on, to the right hand side of the pattern. The second, third, fourth, fifth, sixth, and seventh figures in the succession of treading denote only one space each; and, therefore, they are marked off from their respective divisions. The eighth figure on the treadles is 2, which reverses the division D; therefore, all the spaces corresponding to this division must be marked two spaces upward, for here the weaver goes twice over these treadles; and so on, till the pattern be completed.

Now, it is evident, that by changing the succession of treading, other varieties will be produced; but, in many cases, it will be found more eligible to continue the same order of treading, and to vary the arrangement of the raising cords, as exemplified by the following plans, which have the same draught as the preceding.

No. 3. Fig. 6.

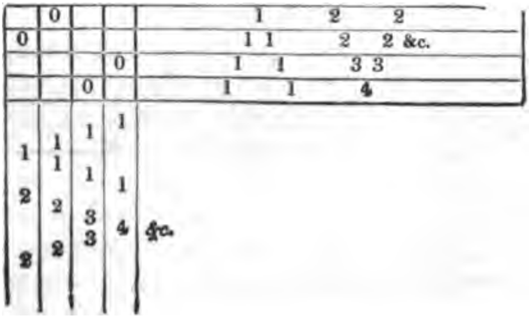


No. 3.

FULL MOUNTING.

0				0				0				0	0	0	
	0				0				0			0	0		0
		0				0				0		0		0	0
			0				0				0		0	0	0
0				0				0	0	0		0			
	0				0			0	0		0		0		
		0				0		0		0	0			0	
			0				0		0	0	0				0
0				0	0	0		0				0			
	0			0	0		0		0				0		
		0		0		0	0			0				0	
			0		0	0	0				0				0
0	0	0		0				0				0			
0	0		0		0				0				0		
0		0	0			0				0				0	
	0	0	0				0				0				0
4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1

No. 4. Fig. 7.

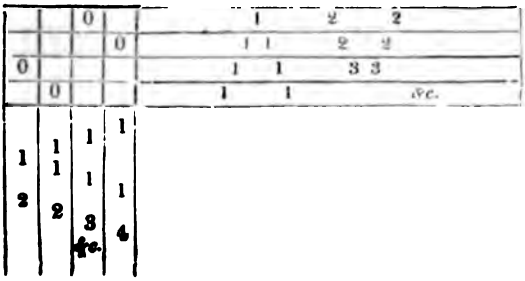


No. 4.

FULL MOUNTING.

			0		0	0	0				0				0	
		0		0		0	0			0				0		
	0			0	0		0		0				0			
0				0	0	0		0				0				
	0	0	0				0				0				0	
0		0	0			0				0				0		
0	0		0		0				0				0			
0	0	0		0				0				0				
			0				0				0		0	0	0	
		0				0				0		0		0	0	
	0				0				0			0	0		0	
0				0				0				0	0	0		
			0				0		0	0	0				0	
		0				0		0		0	0			0		
	0				0			0	0		0		0			
0				0				0	0	0		0				
4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1	

No. 5. Fig. 8.



No. 5.

FULL MOUNTING.

			0				0		0	0	0				0
		0				0		0		0	0			0	
	0				0			0	0		0		0		
0				0				0	0	0		0			
			0				0				0		0	0	0
		0				0				0		0		0	0
	0				0				0			0	0		0
0				0				0				0	0	0	
	0	0	0				0				0				0
0		0	0			0				0				0	
0	0		0		0				0				0		
0	0	0		0				0				0			
			0		0	0	0				0				0
		0		0		0	0			0				0	
	0			0	0		0		0				0		
0				0	0	0		0				0			
4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1

In all these varieties, each set of treadles raises only one division of the tweeling leaves; but it is more frequent in weaving dornic and diaper to raise sometimes two, or more divisions, by the different sets of treadles, as will fully appear by looking over the collection of patterns subjoined to this chapter. The following plan of cording for the preceding draught, will suffice to show how any patterns of this kind may be extended on the full mounting; and which may be also varied in the same manner as the preceding example.

No. 6. Fig. 9.

		0	0	1 2 2 &c.
0			0	1 1 2 2
0	0			1 1 3 3
	0	0		1 1 4
1 2	1 1 2	1 1 3	1 1 4	&c.

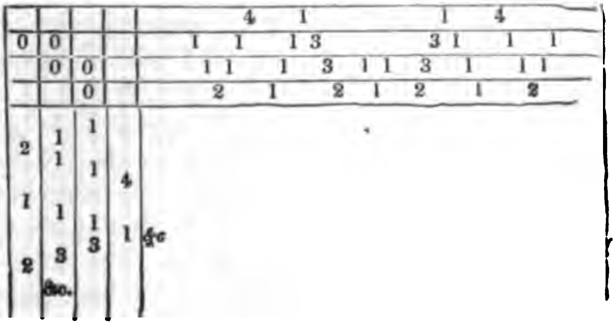
No. 6.

FULL MOUNTING.

0				0				0	0	0		0	0	0		
	0			0				0	0		0	0	0		0	
		0			0			0		0	0	0		0	0	
			0				0		0	0	0		0	0	0	
0	0	0		0				0				0	0	0		
0	0		0		0				0			0	0		0	
0		0	0			0				0		0		0	0	
	0	0	0				0				0		0	0	0	
0	0	0		0	0	0		0				0				
0	0		0	0	0		0		0				0			
0		0	0	0		0	0			0				0		
	0	0	0		0	0	0				0				0	
0				0	0	0		0	0	0		0				
	0			0	0		0	0	0		0		0			
		0		0		0	0	0		0	0			0		
			0		0	0	0		0	0	0				0	
4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1	

Sometimes the reversing of the tweel is omitted altogether by one of the divisions; by which the several members of the pattern are separated from each other, and are formed into distinct spots or figures, as in the annexed example.

No. 7. Fig. 10.



No. 7. FULL MOUNTING.

			0				0				0				0
		0				0				0				0	
	0				0				0				0		
0				0				0				0			
	0	0	0		0	0	0				0				0
0		0	0	0		0	0			0				0	
0	0		0	0	0		0		0				0		
0	0	0		0	0	0		0				0			
			0		0	0	0		0	0	0				0
		0		0		0	0	0		0	0			0	
	0			0	0		0	0	0		0		0		
0				0	0	0		0	0	0		0			
			0				0		0	0	0				0
		0				0		0		0	0			0	
	0				0			0	0		0		0		
0				0				0	0	0		0			
4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1

These examples are all confined to the four leafed regular tweel, for sake of convenience, as formerly noticed; but it is very easy to substitute any other tweel for this that may be desired, as will be evinced by the following example, which is pattern No 3, Fig. 6, woven by a tweel of five leaves, commonly called the diaper tweel.

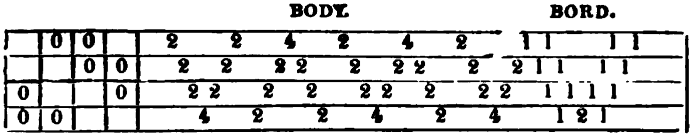
No. 8. Fig. 6.

			0					0					0		0		0	0	0
0					0					0					0	0	0	0	
		0					0					0			0	0		0	0
				0					0					0		0	0	0	0
	0					0					0				0	0	0		0
			0					0		0		0	0	0				0	
0					0					0	0	0	0		0				
		0					0			0	0		0	0			0		
				0					0		0	0	0	0					0
	0					0				0	0	0		0		0			
			0		0		0	0	0				0					0	
0					0	0	0	0		0					0				
		0			0	0		0	0			0					0		
				0		0	0	0	0					0					0
	0				0	0	0		0		0					0			
0		0	0	0				0					0					0	
0	0	0	0		0					0					0				
0	0		0	0			0					0					0		
	0	0	0	0					0					0					0
0	0	0		0		0					0					0			
5	4	3	2	1	5	4	3	2	1	5	4	3	2	1	5	4	3	2	1

When a border is added to any of these patterns, either for table linen, or shawls, it is only necessary to vary the draught of the bord from that of the body; and when working the cross borders, the weaver follows the same order of treading as this part of the draught. Fig. 11 is a pattern of this kind, the cording plan of which is subjoined; the treading of the body and border being the same as their respective draughts.

DIAPER BORDER.

No. 9. Fig. 11.



It has hitherto been understood that diaper patterns are always woven with treadles; but it will be obvious, that, when a five leafed tweel is employed, all the patterns of above three sets of leaves would require so many treadles as would render the operations of the weaver very difficult, if not impracticable. To obviate this difficulty, the mounting represented in Figs. 13 and 14, plate 1, has been invented; by which, with five treadles only, or what are requisite for one set of the tweel, any pattern to the extent of thirty-five leaves, or seven sets of a five leafed tweel, may be easily produced.

In Fig. 14, which is a front view of this mounting, C is the top castle or heddle bearer, D, the leaves of heddles, which, in this example, amount to 20, or four sets of the five leafed tweel. B, is a set of coupers, one for each leaf, to which it is connected by the cord r, and on which the raising cords are tied. There are no sinking cords in this mounting, as the warp lies on the race rod in the same manner as in the mounting Fig. 8. The ends of these coupers, with their raising cords, are seen at B, Fig. 13. E, Fig. 14, is another set of coupers, equal in number to the former, and to which they are respectively connected, for the purpose of raising the opposite ends of the shafts by the cords, *w*.—1, 2, 3, 4, 5, are the ends of a set of upper treadles, or rather marches, one for each leaf of the tweel; a side view of which will be found at A, Fig. 13. Each of these levers is connected to a treadle below, by means of the cords *z*, which pass down through the warp, and are kept in a vertical position by the hole board *x*. *m* and *n* are weights which sink the shafts after they have been raised to form the sheds. The following plan will show how the coupers B, are connected to the levers A.

No. 10.

x		0	0	0	x		0	0	0	x		0	0	0	x		0	0	0
0	0	0	x		0	0	0	x		0	0	0	x		0	0	0	x	
0	x		0	0	0	x		0	0	0	x		0	0	0	x		0	0
	0	0	0	x		0	0	0	x		0	0	0	x		0	0	0	x
0	0	x		0	0	0	x		0	0	0	x		0	0	0	x		0

Here the crosses, or marks ×, point out where the tight cords *i* are tied to the levers A, Fig. 13, and the ciphers denote slack cords which are tied to the small rings *a*; the blank squares denoting that no cords are necessary at these intersections of the coupers and top levers. Hence it will appear, that there is one couper of each set, connected to each lever A, by a tight cord, and one couper of each set that has no connexion whatever with these levers; and also, that there are three coupers of each set that are tied to the small rings *a*. From these rings, cords pass down through the levers A, and up through the box *g*, where they are tied to another set of levers, the ends of which appear at *e*. These levers are again connected to another set *h*, to which the bobs or handles *l* are appended. Fig. 15 is a horizontal plan of the box *g*. On the cords by which the bobs are suspended, are knots, which, passing down through the board *k*, when the bobs are drawn, are prevented from returning, by being put into a narrow cut in the board, as represented at Fig. 16.

Now, if we suppose all the bobs to be disengaged from the board *k*, it is evident that, when any one of the treadles *a*, *e*, *i*, *o*, *u*, are pressed down, there will be only one couper of each set sunk, namely, that which is connected to the top levers A, by the tight cords; and, consequently, when the weaver works over the treadles *a*, *e*, *i*, *o*, *u*, a tweel will be produced of one thread raised and four sunk; for the coupers which are connected by the slack cords, and those which have no cords, will not be affected by the levers A.

Again, were all the bobs drawn down, and the knots fixed in the box *k*, it is obvious, that all the connecting cords would become tight; and, of course, when the under treadles were wrought over, all the coupers in the mounting would be sunk, and their respective leaves raised, except those which have no connexion with the levers A; and thus a tweel would be woven with four leaves raised and one sunk, which is the reverse of the other. Hence it will appear, that when any one or two of the bobs are pulled down, the sets of leaves with which they are connected will produce a tweel the reverse of those which are left; and by this means, any pattern, to the extent formerly mentioned, may be woven by this mounting. Thus, for example, were the pattern Fig. 9, to be woven by this mounting, and by a five leafed tweel: then, the cording on the coupers B, Fig. 13, plate 1, may be the same as in the preceding plan, No. 10; and the draught and cording, as in No. 6, binding plans. Now, as each of the bobs or handles 1, 2, 3, 4, Fig. 13, is connected to its respective division, and two divisions raised for each set of sheds; it follows, that two of these handles must be pulled down each time the weaver has occasion to change from one set of sheds to another. In weaving the pattern above quoted, therefore, the weaver pulls down the bobs 1 and 2, because these two bobs correspond with the two back divisions, on which there are raising marks where they cross the first treadle. He then works once over his treadles below, as there is only 1 marked on the binding plan. For the second change of sheds, the bobs 1 and 4 must be pulled down, these being connected with the back and front divisions, and the treadles, likewise, are to be once wrought over. For the third change of sheds, the bobs 3 and 4 are pulled, agreeably to the marks on the binding plan, and the treadles gone once over; and so on till he comes to the eighth change of sheds, where there is 2 marked on the treadle; which indicates that here he must work twice over the treadles: and so of the others. The process of weaving diaper by the back caam will be explained when we come to treat of the draw-loom. The following is a plan of the four leafed tweel for dornic.

No. 11.

	0	0	x	‖		0	0	x	‖		0	0	x	‖		0	0	x	‖
0		x	0	‖	0		x	0	‖	0		x	0	‖	0		x	0	‖
0	x		0	‖	0	x		0	‖	0	x		0	‖	0	x		0	‖
x	0	0		‖	x	0	0		‖	x	0	0		‖	x	0	0		‖

Another plan for the five leafed tweel. The cording on the coupers B, Fig 13, is adapted to this plan.

No. 12.

0		0	x	0	‖	0		0	x	0	‖	0		0	x	0	‖	0		0	x	0	‖	0		0	x	0	‖
x	0	0	0		‖	x	0	0	0		‖	x	0	0	0		‖	x	0	0	0		‖	x	0	0	0		‖
0	0	x	0	0	‖	0	0	x	0	0	‖	0	0	x	0	0	‖	0	0	x	0	0	‖	0	0	x	0	0	‖
	0	0	0	x	‖		0	0	0	x	‖		0	0	0	x	‖		0	0	0	x	‖		0	0	0	x	‖
0	x	0		0	‖	0	x	0		0	‖	0	x	0		0	‖	0	x	0		0	‖	0	x	0		0	‖

This is the most perfect plan of the five leafed tweel; but it will be observed, that the mark × for the tight cord falls on the centre of the middle treadle, which should also have been a blank space. To obviate this, the tight cord is so fastened that the weaver can use it as a tight or slack cord at pleasure.

The following collection of patterns will be found useful, not only for dornic and diaper, but in several branches of the cotton and silk manufacture, such as crapes, flushed borders and robes, dumb flowers, Turkey gauze, &c. which will be exemplified under their proper heads.

A COLLECTION OF DIAPER PATTERNS FROM TWO TO SEVEN DIVISIONS.

No. 13. Fig. 3. No. 14.

0		3 1 3 3 1	0		1 1 5 1 1 7
	0	1 1 10 1 1		0	1 4 4 1 2 2

No. 15. Fig. 4. No. 16.

0		2 2 5 1 5 2 2	0		8 1 1 1 3 3
	0	3 1 3 2 2 3 1 3		0	4 4 1 1 1 9

No. 17. No. 18.

0		5 5 1 1 1 5 5	0		1 5 1 5
	0	5 1 5 1 1 5 1		0	1 5 1 5

No. 19. No. 20.

0		5 2 1 2 2 1 2	0		1 1 1 1 4 1 4
	0	2 1 2 5 2 1 2		0	1 1 1 4 1 1 4

No. 21. No. 22.

0		1 1 1 1 8 1 1 1 1 10	0		4 4 4 1 1 1
	0	1 1 1 6 6 1 1 1 4 4		0	4 4 4 1 1 1

FOR THREE DIVISIONS.

Two Divisions raised. No. 23. Three raised

			4 4 4			0
	0		1 1 2 1 1 2 1 4 1 1 1		0	
0			1 1 1 1 4 1 2 1 1 2 1 1 1	0		

No. 24.

0			1 8 1 1 8 1
	0		3 1 1 3 1 3 3 1 3 1 1 3
		0	1 1 1 3 1 1 1

No. 25.

		0	1 1 4 4 1 1
	0		1 1 1 3 1 3 1 1 1
0			5 5 5 5

No. 26.

		0	1 1 3 3 1 1 2 1 2 1 1
	0	0	1 1 1 3 1 1 3 1 1 1 3 1 1 3 1 1 1
0	0		1 1 2 1 2 1 1 2 3 1 1

No. 27.

0			1 1 1 2 1 1 2 1 1 1
0	0		1 1 1 1 2 2 1 1 1 1
	0	0	2 1 1 2 1 2 1 1 2

No. 28.

0	0		3 1 1 3 3 1 3
	0	0	3 3 3 3
		0	3 1 3 3 1 1 3

PATTERNS FOR FOUR DIVISIONS.

No. 29.

0				1 3 3 1 1 3 3 1
	0			1 1 1 1 1 1 1 1
		0		1 1 1 1 1 1 1 1
			0	1 1 3 3 1 3 3 1 1

No. 30.

			0	1 4 1 1 4 1 1 4 1 1 4 1
		0		2 2 2 2 2 2 2 2
	0			1 1 1 1 4 1 1 1 1 2 1 2 2 1 2 1 1
0				1 1 2 1 2 2 1 2 1 1 1 1 4 1 1 1 1

No. 31.

			0	11 1 212 212 1 11 22 22 11 1
		0		2 1 1 22 22 11 2 212 212 2 11
	0			1 1 1 313 11 1 3113 1 11
0				1 1 1 3113 1 1 1 313 1 1 1

No. 32.

0				2 2 2 4 4 2 2 2
0	0			11 11 3 3 11 11
	0	0		1 1 1 1 3 1 1 3 1 1 1 1
		0	0	1 1 1 1 3 2 3 1 1 1 1

No. 33.

			0	1 5 5 1
		0		1 11 1 3 3 1 11 1
	0			11 11 3 3 11 11
0				1 1 3 1 3 1 1

No. 34.

				5 5 5 5
		0		1 1 3 3 1 2 1 2 1 1
	0	0		1 1 1 1 1 3 1 1 3 1 3 1 1 3 1 1 1 1 1
0	0			1 11 1 2 1 2 1 3 3 1 11 1

No. 35.

		0		2 1 1 3 3 1 1 2
			0	11 1 1 3 3 1 1 11
0				1 1 11 1 1 2 3 2 1 1 11 1 1
	0			1 1 2 1 3 1 1 1 1 3 1 2 1 1

No. 36.

		0		1 2 1 2 2 1 2 1
			0	1 1 2 2 2 2 1 1
0				1 1 1 3 3 1 1 1
	0			1 1 3 1 1 1 3 1 1

No. 37.

		0		2 2 2 2
			0	2 1 2 2 1 2
0				2 2 2 2 2 2
0	0			4 4 4

No. 38.

		0		1 2 1 3 1 2 3 1 3 1 2 1
			0	1 1 1 1 3 1 1 3 3 1 1 3 1 1 1 1
0				1 1 1 1 3 1 1 1 1 3 1 1 1 1
	0			1 1 1 1 3 1 2 1 3 1 1 1 1

No. 39.

				1 5 1 1 5 1
0	0	.		1 1 3 1 1 3 1 1
	0	0		1 1 3 3 1 3 3 1 1
		0		1 1 3 3 3 3 1 1

No. 40.

				4 3 3 4
	0	0		1 1 1 3 6 3 1 3 6 3
		0		1 1 3 1 3 3 1 3 3 1 3 3 1 3
0				3 1 1 3 3 1 1 1 1 3 1 1 3 1 1 1 1 3 3

No. 41.

			0	1 3 3 1 3 1 3 1
		0	0	1 3 1 1 3 1 3 1 1 3 1
	0	0		1 3 1 1 3 1 3 1 1 3 1
0	0			1 3 1 3 1 3 3 1

No. 42.

		0	0	1 1 3 6 3 1 1
			0	1 1 1 3 1 3 3 1 3 1 1 1
0				2 1 1 2 1 1 1 1 2 1 1 2
0	0			1 1 1 4 1 1 4 1 1 1

No. 43.

		0	0	4 4 4 4
			0	2 2 2 2 1 1 1 1 2 2 2 2
0				1 3 1 3 3 1 3 1
0	0			3 6 3

No. 44.

				1 4 1 1 1 1 4 1
0	0			1 1 1 1 1 1 3 3 1 1 1 1 1 1
	0	0		1 1 1 1 1 1 3 1 1 3 1 1 1 1 1 1
		0		1 1 1 1 1 1 1 1 1 1 1

No. 45.

		0	0	1 4 3 1 2 1 3 4 1
0			0	1 1 3 1 1 1 1 3 1 1
0	0			1 1 3 1 1 1 1 3 1 1
	0	0		2 3 1 1 1 1 3 2

PATTERNS FOR FIVE DIVISIONS.

No. 46.

					5 1 1 5
0	0	0			1 3 1 3 1
	0	0	0		3 3 3 3 3 3 3 3
		0	0		3 3 3 3 3 3 3 3
			0		3 3 3 3 3 3 3 3

No. 47.

					4 4
	0	0	0		1 1 1 2 4 2 1 1 1
		0	0		1 1 2 2 2 2 1 1
			0		1 1 2 1 2 2 1 2 1 1
0					3 1 1 3 3 1 1 1 1 3 3 1 1 3

No. 48.

			0	0	1 2 2 1 1 2 2 1 1 2 2 1
				0	2 1 1 2 2 1 1 2 2 1 1 2
0	0				3 3 3 1 3
	0	0			3 3 3 3
		0			1 3 1 3 1 3 3 1

No. 49.

			0	0	4 4 4
				0	2 2 2 2 2 2
0	0				3 1 1 3 3 1 3
	0	0			3 3 3 3
		0			3 1 3 3 1 1 3

No. 50.

			0	0	1 1 2 2 2 2 1 1
0				0	1 2 2 2 2 1
0	0				1 1 1 3 3 1 1 1
	0	0			1 1 1 3 3 1 1 1
		0	0		1 1 1 1 6 1 1 1 1

No. 51.

			0		2 1 2 1 1 2 1 2
				0	2 2 2 2
0	0				3 1 3 1 1 1 1 3 1 3
	0	0			3 3 1 1 1 1 1 1 3 3
		0			3 1 1 3 1 1 1 1 1 3 1 1 3

PATTERNS FOR SIX DIVISIONS.

No. 52.

				0	0	1 2 2
			0		0	1 1 2 1 2
		0		0		1 1 2 2
	0		0			1 1 1 1
0		0				1 1 1 1 1 1
0	0					1 1 1 1

No. 52, CONTINUED.

2 2 1
2 1 2 1 1
2 2 1 1
2 2 1 1 1 1
2 1 1 2 1 1 1 1 1 1
2 1 2 1 1 1 1

No. 53.

						2 2 2
0	0					1 1 1
	0	0	0			1 1 1 1 1 1
		0	0			1 1 1 1 1 1
			0	0		1 1 1 1 1 1
				8		1 1 1 1 1 1

No. 54.

				0	0	4 4
					0	2 2 2 2
0	0	0				3 3 3 3
	0	0	0			3 3 3 1 1 1 1
		0	0			3 3 3 1 1 1 1 1 1
			0			3 1 3 1 2 2

No. 54, CONTINUED.

4 4
2 2 2 2
3 3 3 3
3 3 3
3 3 3
2 1 3 1 4

No. 55.

				0	0	1 1 4 4 4 4 1 1
					0	1 1 1 2 2 2 2 2 2 2 2 1 1 1
0						1 1 1 1 3 1 1 3 1 1 1 1
0	0					1 1 1 1 3 11 11 3 1 1 1 1
0	0	0				11 11 3 1 1 1 1 3 11 11
	0	0	0			1 1 1 3 1 5 1 1 1

No. 56.

				0	0	1 4
					0	2 2
0	0	0				3 2 2 3 1 2 1
	0	0	0			3 3 11 3 1 1 3 11
		0	0			3 3 1 1 3 3 1 1
			0			1 3 3 1 2 1 2 2 1 2

No. 56, CONTINUED.

4 1
2 2
3 2 2 3
3 3
3 3
1 3 3 1

PATTERNS FOR SEVEN DIVISIONS.

No. 57.

				0	0	0	1 1 1 2 4 2 1 1 1
					0	0	1 1 2 22 2 1 1
						0	1 1 212 212 1 1
0	0						11 1 11 11 1 11
	0	0					1 1 1 1
	0	0	0				2 2 2 2
			0				1 1 1 1

No. 58.

					0	0	4 4
						0	2 2 2 2
0	0	0	0				1 1 1 1 1 1
	0	0	0				2 1 2 2 4 2 2 1 2
		0	0	0			1 1 2 22 2 1 1
			0	0			1 1 212 212 1 1
				0			1 1 1 1 1 1 1 1

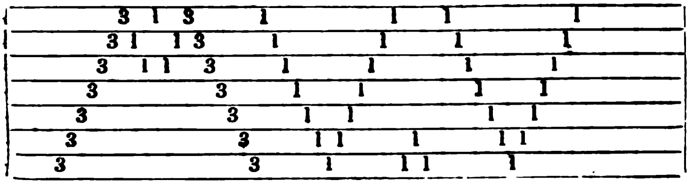
No. 59.

				0	0	0	11 11
					0	0	2 2 2 2
						0	1 1 1 1 1 1 1
0							1 1 1 1 1 1 1 1
0	0						2 2 2 2 2 2
0	0	0					3 3 3 3 3 3
0	0	0	0				1 1 1 1 1 1

No. 60.

					0	0	1 1 1 1
				0		0	1 1 1 1
			0		0		1 1 1 1
		0	0	0			1 1 1 1
	0		0				1 1 1 1
0		0					1 1 1 1 1
0	0						1 1 1 1

No. 60, CONTINUED.



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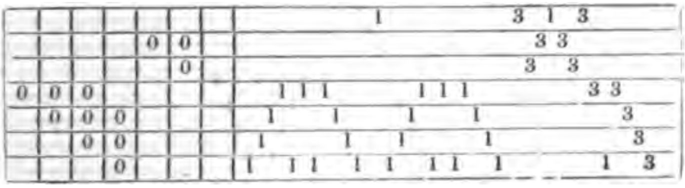

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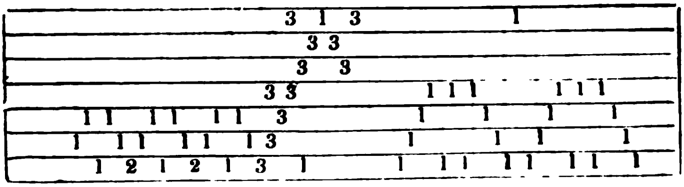

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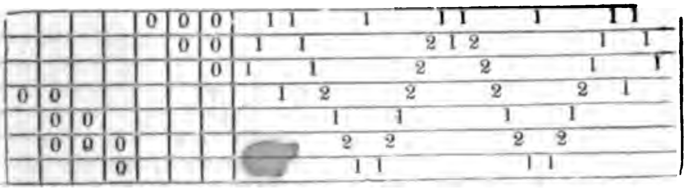


No. 63.

				0	0	0												1		1														
					0	0											2				2													
						0										1						1												
0	0						2				1				2								2								4			
	0	0						1						2										2						2		2		
	0	0	0						1				1												2		1		2				2	
			0							1		1							1							1		1						1

No. 63, CONTINUED.

							1		1											
						2				2										
					1						1									
				2								2				1				2
			2										1						1	
1		2												1				1		
	1							1							1		1			

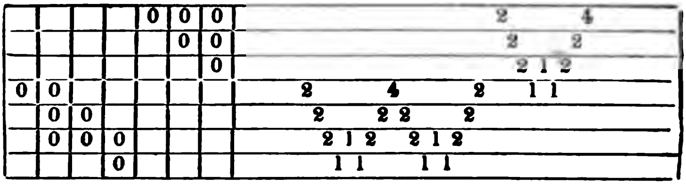
No. 64.

			0	0	0												1		1														
				0	0											2				2													
					0										1						1												
0						2				1				2								2								4			
0	0						1						1										2			1			2		2		
0	0	0						1				1												2				2				2	
	0	0	0						1		1							1							1		1						1

No. 64, CONTINUED.

							1		1											
						2				2										
					1						1									
				2								2				1				2
1			2										1						1	
		2												[illegible]				1		
	1							1								[illegible]				

No. 65.



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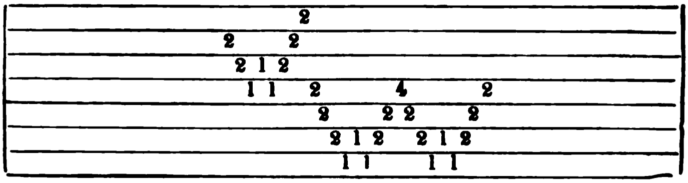

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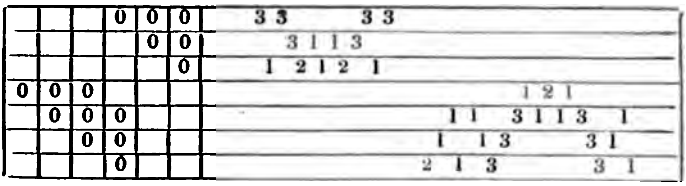

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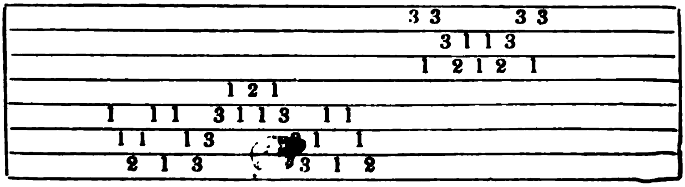


No. 67

							5
0					0	0	1 1 1 1 3
0	0					0	1 1 1 1 3
0		0					1 1 1 3
	0		0				1 1 3 1
	0	0		0			1 1 3 1 1
			0	0	0		1 1 3 1 1

No. 67, CONTINUED.

1 5
1 1 3 1 1 1 1
1 1 3 1 1 1 1
1 3 1 1 1
1 3 1 1
1 1 3 1 1
1 1 3 1 1

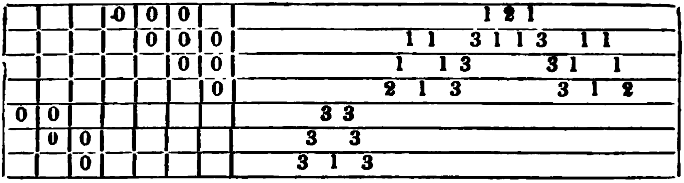
No. 68.

							1 1 1 3 1
					0	0	4 4 4
						0	1 1 1 1 1 1
0	0	0					1 2 1
	0	0	0				1 1 3 3
		0	0				1 1 3 3
			0				1 1 3 3

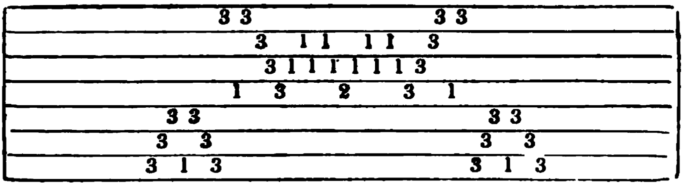
No. 68, CONTINUED.

1 1 3 1 1 1 1
4 4 4
1 1 1 1 1 1
1 1 1 2 1
3 3 3 3 1 1
3 3 3 3 1 1
1 3 3 1 3 3 1 1

No. 69.



No. 69, CONTINUED.



Note. The Cordings of all these plans may be varied as in the example given page 80, and the number of leaves or divisions to be raised, will depend on the kind of weaving to which they are to be applied.

CHAP. V.

DOUBLE CLOTH.

THIS is one branch of fancy weaving, which has hitherto lent but little aid towards the extension of the cotton or silk manufacture; having been almost exclusively confined to the manufacture of carpets and quiltings. There seems, however, little room to doubt, were this branch of weaving more generally known among our manufacturers, that it might be applied, with considerable advantage, in the fabrication of various species of cotton and silk goods; especially of such as are in request for warmth and durability.

Double cloth is, for the most part, composed of two similar fabrics, generally plain, which are interwoven at various intervals, and formed into a diversity of figures, agreeably to the design of the pattern to be produced. This is the method usually pursued in carpet weaving. Sometimes one of the fabrics is superior in quality to the other, as in quiltings; in which the superior fabric is called the face, and the inferior, the back. It will therefore be necessary, in explaining the principles of this branch of weaving, to take these two methods separately into consideration: and, in discussing the former, the reader would do well to keep in view the plans and descriptions of diaper weaving, given in the last chapter, to which the mountings and processes of weaving double cloth bear a strong analogy.

SECT. I.

DOUBLE CLOTH BY THE JUNCTION OF TWO EQUAL FABRICS.

In order to render this species of weaving as perspicuous as possible, let us take, for example, the warp of any plain fabric, one thread of which is blue, and the other white, alternately, and let us suppose this warp to be drawn through a common four leafed set of plain heddles, in the usual way. Then it will appear from the following plan, that, when the draught commences with a blue thread, all the other blue threads will be drawn on the two back leaves at 3, 5, 7, &c. and all the white threads, as numbered 2, 4, 6, &c. will be drawn on the two front ones: and, farther, that by the proper application of a pair of treadles, this mounting will produce the following varieties:—

First, When the two back leaves are raised and sunk alternately with the two fore ones, and white weft thrown across, the whole fabric, which is plain cloth, will be formed into very small blue and white stripes: and if a shot of blue and a shot of white be thrown in alternately, a corresponding check will be produced. These sheds will be opened by the two treadles marked A.

Secondly, If the two fore leaves were constantly sunk, and the back leaves raised alternately, it is plain, that, by throwing in blue weft, all the blue warp would be woven into a uniformly blue fabric, leaving all the white warp unwoven below. This would be the effect of the two treadles marked B.

Thirdly, And, were the two back leaves constantly raised, and the two front leaves raised alternately, a white fabric would be produced, by throwing across white weft, leaving out the blue warp, above. See the treadles marked C.

Fourthly, All the blue warp is sunk, and white cloth woven, by the treadles D; and

Fifthly, The white warp is all raised, and blue cloth produced by the treadles E.

No. 1.

	0		0	0	0				0	5 1	Blue.
	0	0		0	0			0		7 3	Blue.
0					0		0	0	0	6 2	White.
0				0		0		0	0	8 4	White.
1	2	3	4	5	6	7	8	9	10		
A.		B.		C.		D.		E.			

By consulting this small scheme, it will be manifest, that each of these webs may be woven separately and distinctly from the other, either when the white or the blue warp is uppermost; but the manner in which they are woven together, and made to pass through each other, at pleasure, will appear from the following plans:—

No. 2.
White
above.

No. 3.
Blue
above.

			0	1 1	0		0	0	Blue.
	0			3 3	0	0	0		Blue.
	0	0	0	2 2			0		White.
0	0		0	4 4	0				White.
7	9	8	10		5	3	6	4	
2d. White Shot.	2d. Blue Shot.	1st. White Shot.	1st. Blue Shot.		2d. White Shot.	2d. Blue Shot.	1st. White Shot.	1st. Blue Shot.	

If this plan be examined with attention, it will be found, that, in No. 2, where the white warp is above, when the treadle marked 10 is pressed down, one blue leaf is raised and the other sunk, while all the white warp is raised above the shuttle; and therefore, one shot of blue weft is thrown into this shed, to form the blue fabric. When the treadle

8 is pressed down, it raises one white leaf and sinks the other; while, at the same time, all the blue warp is sunk quite clear of the shuttle: into this shed the first white shot is thrown. The treadle marked 9 reverses the blue shed, keeping the white warp still above; into this shed the second blue shot is thrown: and the treadle 7 sinks all the blue warp, and reverses the white shed for the second white shot. The numbers on these treadles refer to those on the plan No. 1.

By following this process, the two webs would be woven quite distinct from each other, the white web above the blue one; but when the set of treadles at No. 3 are employed, the two webs will change places, and the blue web will now be above, as will appear by comparing the raising marks upon the treadle plans. Hence, if one shuttle only were employed for both webs, so long as the weaver continued to work upon one set of treadles, the two webs would still be distinct except at the selvages, where they would be united by the weft. After this manner are the hempen pipes woven, which have been lately adapted in France, to the fire engine; likewise the wicks for the patent lamps, &c.*

Plaits or folds are sometimes woven in the loom upon the ends of muslin plaids, or the borders of garments, as part of their ornament. This is effected by working, on a pair of treadles, about a half, three-fourths, or a whole inch, according to the size of the plait; the treadle being corded in the same manner as any of the sets B, C, D, or E, in No. 1: and this small piece, which contains only half of the warp, is drawn forward by the reed to the face of the original cloth, each half of the warp being on a separate roll. Sometimes both portions of the warp are woven separately in this manner, for a small space, and a number of ends of coarse yarn thrown in between them, forming a fine bold cord, covered on both sides with the cloth. The treadles either of No. 2 or No. 3 would produce this effect.

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* The weaving of double cloth may be applied to many other useful purposes, as well as to articles of curiosity. It was on the principle of double cloth that Mr. DAVID ANDERSON, Damask Manufacturer, Glasgow, lately wove a shirt with a fine frill, double stitched neck, shoulder straps, and wrist bands; also gussets, buttons, button holes, &c. with the Royal Arms emblazoned on the breast. The whole of this production was executed entirely in the loom, without the smallest aid of needle-work. This shirt was presented to His Majesty George IV. who was graciously pleased to express his high satisfaction with the ingenuity of this performance, and through the Right Hon. Lord Sidmouth, His Majesty's Secretary of State, remitted Mr. Anderson £50. Another specimen of Mr. ANDERSON's ingenuity in this line is deposited in the Hunterian Museum, Glasgow.

If the treadles No. 2 are wrought over a certain number of times, throwing in blue and white weft alternately, and the treadles No. 3, as often, blue and white stripes will be produced, running across the web; but, when the two warps are to be raised, so as to form checkers or alternate squares, another set of leaves must be added, and a certain portion of the warp drawn upon one set, and an equal portion on the other, alternately; and these portions, on each set, must be drawn in the very same order as in the preceding plan. The annexed scheme will make this plain.

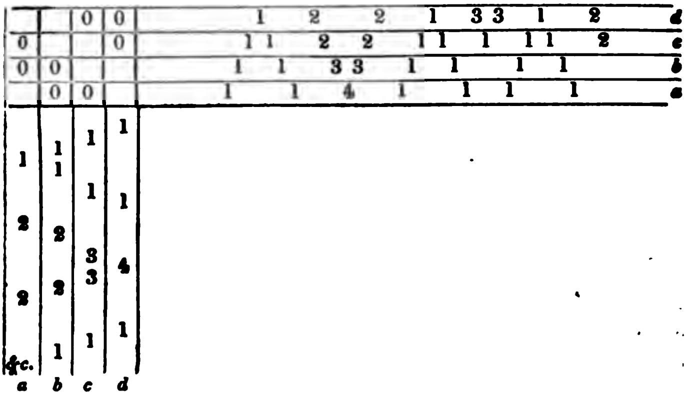
No. 4. Fig. 1. Plate 4.

White above.				Blue above.																					
			0	0		0	0												5				1	Blue.	A.
	0			0	0	0											7				3			Blue.	
	0	0	0			0												6				2		White.	
0	0		0	0												8				4				White.	
0		0	0				0				5				1									Blue.	B.
0	0	0			0				7				3											Blue.	
		0			0	0	0			6				2										White.	
0				0	0		0	8				4												White.	
4	3	2	1	4	3	2	1																		
Blue above. A.				White above. B.																					

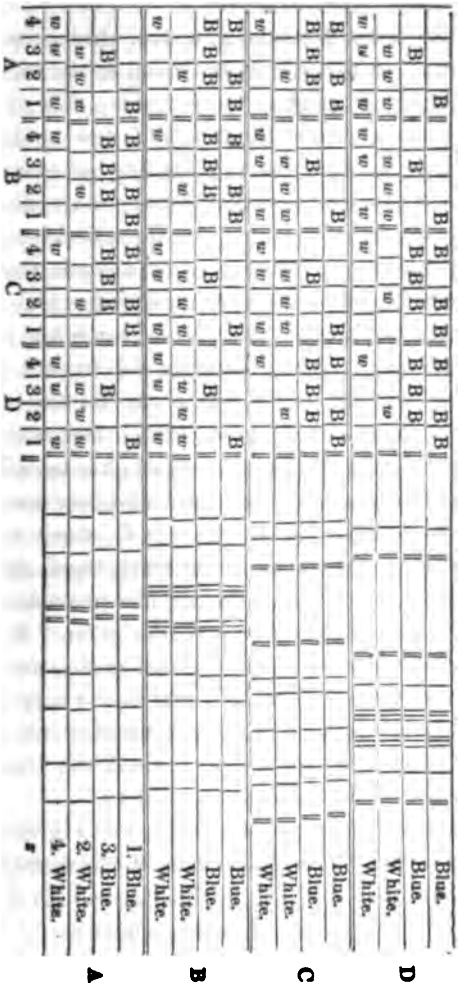
In this plan we see that a portion of the two warps is drawn jointly on the back set of heddles marked A, and another portion on the front set B, alternately, agreeably to the intended size of the checkers: and farther, that the raising cords are so disposed, that, when the set of treadles A, is wrought over any number of times, according to the number of draughts in each checker, the leaves at A will produce a square of double cloth with the white above, and the leaves B will produce another square with the blue above: and also, that when the treadles at B are wrought over, in the same manner, the leaves A will throw the blue cloth above, and the leaves B, the white above; and thus the checker pattern is produced by double cloth.

If these examples are compared with those of the reversed tweeling, the similarity which subsists between these two branches of weaving will become apparent; and by reverting also to the instructions and examples laid down in the preceding chapter, it will be easy to perceive, that, with a little attention to the arrangement of the raising cords, all that boundless variety of pattern which is woven on diaper, may also be produced by double cloth: for it is merely substituting one set of double cloth leaves, with its respective treadles and cording, in the latter, for each set of the tweeling apparatus in the former. And hence it will be obvious, that all patterns woven by two divisions, or sets, such as Fig. 1, 2, 3, 4, Plate 4, will have their cordings the very same as in No. 4; the diversity of figure arising solely from the succession of the draught and treading, and therefore can require no further explanation. It will be proper, however, to insert one example, to show how diaper, or any other patterns which require a greater number of divisions, may be adapted to double cloth, and for this purpose, let the binding plan of No. 6 be resumed, with the cording of Fig. 9.

No. 5. Fig. 9.



Now, the full mounting for this pattern upon the double cloth principle will be as follows; in which, the better to distinguish the two webs, the raising marks of the blue warp are denoted by B, and those of the white warp, by *w*.


Blue.
Blue.
White.
White.
Blue.
Blue.
White.
White.
Blue.
Blue.
White.
White.
1. Blue.
3. Blue.
2. White.
4. White.
D
C
B
A
4 3 2 1 4 3 2 1 4 3 2 1 4 3 2 1
A B C D

No. 6.

In this plan, the draught is the same as in the diaper mounting; with this exception only, that in the diaper, each straight line over the leaves of the different divisions, represents the warp threads as drawn straight over these leaves, whereas, in this, they are drawn in the order of the figures, 1, 2, 3, 4, as at *x*.

It is farther to be observed, that, by following the succession of treading marked on the binding or general plan, No. 5, the weaver works once over the set of treadles marked D, by which all the white warp on the divisions A and B will be woven above, and all the white warp on the divisions C and D will be woven below, raising the blue cloth to form the figure, and this is effected by throwing in a blue shot on the treadle 1, a white one on the treadle 2, a blue one on the treadle 3, and a white one on the treadle 4. He then works once over the treadles C, once over B, once over A, once over B, once over C, and once over D, all in the same manner as at first; after which he continues to work twice over the treadles A, twice over B, three times over C, and four times over D; and so forth, agreeably to the succession of the draught; all which, it is presumed, will be plain from an attentive perusal of the plan. It may be further observed, that by applying the raising cords as in the diaper examples, No. 3, 4, 5, and 6, the corresponding figures 5, 6, 7, 8, plate 4, will be produced, in all of which, the shaded parts of the figures show where the blue cloth is raised above the white, to form the pattern.

In this manner, patterns may be woven in great variety, and might be applied with good effect, in the manufacturing of shawls, bed covers, and other fabrics, in which durability and a display of colours are desirable qualities.

SECT. II. OF THE JUNCTION OF TWO UNEQUAL FABRICS.

This species of double cloth is chiefly confined to the fabrication of quiltings, or Marseilles, which are manufactured in considerable quantities in England, and printed for vest pieces.

The mounting of a quilt consists of a set of plain heddles, usually four, for the face, and a number of stitching leaves, proportionate to the range of the pattern, for the back; and these produce all the variety of figure in the design. The stitching leaves are frequently adapted to diagonal and diamond patterns, although they may be made to produce any other fanciful figures, at pleasure; and the range of pattern, as in other branches of fancy weaving, may be enlarged beyond the power of leaves, or until the application of a harness becomes necessary.

Quiltings are generally woven in reeds of the Manchester and Bolton count, which contain a certain number of beers, or porters, in 24¼ inches. The warp and weft of the face are considerably finer than those of the back; and two threads of the face and one of the back are drawn into the same interval of the reed. If we take, for example, a No. 36 reed, that is, 36 beers on 24¼ inches, the warps and wefts, as noted below, will make a pretty good quilt, or Marseille.

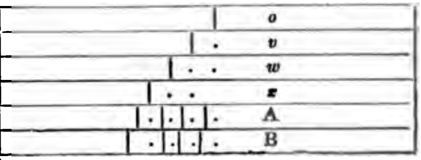
For the face, ——————No. 36 }
For the back, —————— 26 } warps.

Face, ——————No. 46 }
Back, —————— 36 } wefts.

In weaving these fabrics, there are two shots of the fine, and two of the coarse weft thrown in alternately. One shot of the fine stitches the back and face together, and one shot of the coarse is thrown in between the back and the face, clear of both fabrics; and this is called the wadding. The other coarse shot goes into one of the sheds that works the back, so that when eight shots of weft are woven, four go to the face, two for wadding, and two are thrown into the two alternate sheds of the back. The following plan will show the construction of a Marseille mounting:—

No. 7. DIAGONAL QUILT.

		0		0			
0					0		
		0				0	
0							0
0	0	0	0				
0		0	0	0	0	0	0
8 16	2 6 10 14	4 12	3 7 11 15	13	9	5	1
a	*b*	*c*	*d*	*e*	*f*	*g*	*h*

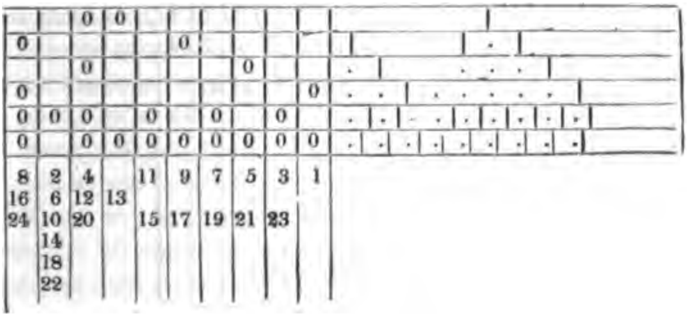


In the above plan, A and B are the two leaves for the face, and *o*, *v*, *w*, *x*, the stitching or back leaves. The treadle *b* opens one shed of the face and sinks all the warp of the back; and this treadle works alternately with the treadles *e*, *f*, *g*, *h*, which open the other shed of the face, and, at the same time raise, each one of the back or stitching leaves. The treadles *a* and *c* open the two sheds of the back; while, at the same time, they raise all the warp of the face above the shuttle. The treadle *d* opens the shed for the wadding, by raising the face and sinking the back.

By tracing over the figures that point out the order of treading, it will be found, that the first and second shots, which are fine, are thrown into the face; but, at the first tread, the stitching leaf *x* is raised, by which the back and face are tacked together. The third and fourth shots are coarse; the former goes for wadding, and the latter is the first shot of the back. The fifth and sixth shots are fine, which are wrought into the face; but the former has the back leaf *w* raised, by which the back is again stitched to the face. The seventh and eighth shots are coarse; the former goes for wadding, and the latter forms the second shot of the back: and thus any pattern may be woven at pleasure, according to the succession of the draught on the stitching leaves, and the order in which they are raised.

Although the preceding plan is given in the most concise form of which it is susceptible, in order to render the principle of this species of weaving as perspicuous as possible, yet, in practice, the weaver would find it very awkward to shift his right foot from each of the stitching treadles to the wadding one, while his left is engaged with a different succession on the three others. To obviate this, a wadding treadle, with the same cording, is usually placed, alternately, with a stitching one; by which arrangement, the succession of treading, for the right foot, will be in a regular or progressive order over the treadles. This arrangement is common in practice, and is therefore adopted in the following examples.

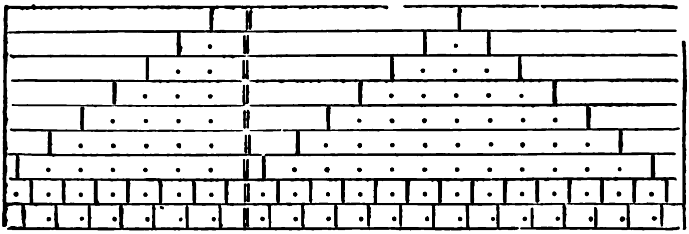
No. 8. A DIAMOND QUILT.



		0	0						
0					0				
		0					0		
0									0
0	0	0		0		0		0	
0		0	0	0	0	0	0	0	0
8 16 24	2 6 10 14 18 22	4 12 20	13	11 15	9 17	7 19	5 21	3 23	1

No. 9.
WAVED QUILT.

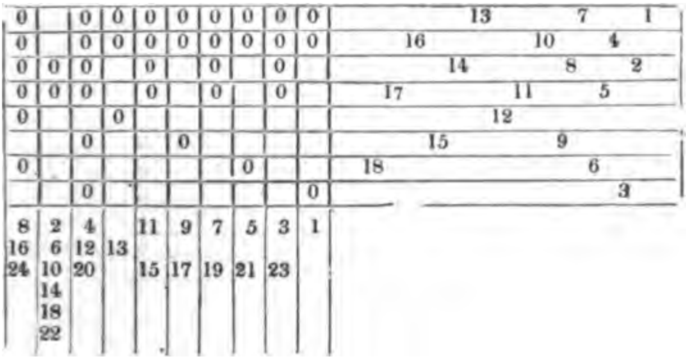
No. 10.
DIAMOND QUILT.



CORDING OF No. 9 AND 10.

0			0													
		0			0											
0							0									
		0							0							
0											0					
		0											0			
0															0	
0	0	0		0		0		0		0		0		0		
0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8 16 24 32 40 48	2 6 10 14 18 22 26 30 34 38 42 46	4 12 20 28 36 44	25	23 27	21 29	19 31	17 33	15 35	13 37	11 39	9 41	7 43	5 45	3 47	1	

No. 11. DIAMOND QUILT WITH FOUR FACE LEAVES.



0		0	0	0	0	0	0	0	0	13 7 1
0		0	0	0	0	0	0	0	0	16 10 4
0	0	0		0		0		0		14 8 2
0	0	0		0		0		0		17 11 5
0			0							12
		0			0					15 9
0							0			18 6
		0							0	3
8	2	4		11	9	7	5	3	1	
16	6	12	13							
24	10	20		15	17	19	21	23		
	14									
	18									
	22									

To prevent the repetition of the wadding treadle, a stick, moving on its centre at the left is sometimes laid across, a little above the stitching treadles, and connected to the wadding treadle, which is placed at the right. As the weaver works along the stitching treadles, whenever he has occasion to sink the wadding one, he has only to shift back his heel on this stick, and press down the treadle, without moving his foot either to the right or left.

SECT. III. OF TWEELING DOUBLE CLOTH.

Although tweeling, however extensively it may be otherwise employed, is seldom applied to double cloth, yet, as there is great room here for a display of ingenuity, especially in the manufacture of shawls, plaids, bedcovers, &c. it will be necessary to show how the several varieties of this kind of texture may be produced.

It has been already observed, that four leaves, two for each set, are required to weave double cloth of the plain texture. If, therefore, one set of tweeling leaves be substituted for each set of the plain ones, it will be obvious, that every variety of pattern that can be produced on the plain texture, can likewise be effected on tweeling. The following plan is for the three leafed tweel.

No. 12.

0		0		0	0						1	*w*
0		0	0	0					3			*w*
0	0	0		0			5					*w*
0		0								2		*b*
0				0				4				*b*
		0		0		6						*b*
6	5	4	3	2	1							

Suppose the warp on the three leaves marked *w* to be white, and that on the three marked *b* to be black; then white weft thrown in on the three treadles 1, 3, 5; and black on 2, 4, 6, will make the white cloth above and the black below: and if these two webs be made to pass through each other at different intervals, patterns may be produced in the same manner as explained in section 1st.

This mounting makes the one web pure black and the other pure white; but if the two colours of weft be different from the warp, then we may throw the greater proportion of either one or both warps outward, or of one or both warps inward; and thus a variety of colours may be displayed, in a manner that at present is not very common. As it would require, however, a great number of leaves and treadles to weave but a very limited pattern on this principle, even with the economical plans of the diaper, this style seems to be peculiarly adapted to the draw loom; under which head the subject of tweeling double cloth will be farther illustrated. In the meantime it may be of use to insert a few plans, to show how these various changes may be effected on a uniform ground. Suppose, therefore, the warp of one web to be purple, and of the other, green; and that they are to be wefted with two colours of weft, the one red and the other yellow: then, among others, we may have the following varieties:—

No. 13.

		0		0		0		1	Pur.	
0				0		0		3	Pur.	**Yellow weft shows below.**
0		0				0		5	Pur.	
0		0		0				7	Pur.	
0		0		0		0	0	2	Gr.	
0		0		0	0	0		4	Gr.	**Red weft shows above.**
0		0	0	0		0		6	Gr.	
0	0	0		0		0		8	Gr.	
8	7	6	5	4	3	2	1			
4th Yellow do.	**4th Red do.**	**3d Yellow do.**	**3d Red do.**	**2d Yellow do.**	**2d Red do.**	**1st Yellow do.**	**1st Red Shot.**			

No. 14.

						0		1	Pur.	
				0				3	Pur.	**Purple warp shows below.**
		0						5	Pur.	
0								7	Pur.	
0		0	0	0	0	0	0	2	Gr	
0	0	0		0	0	0	0	4	Gr.	**Green warp shows above.**
0	0	0	0	0		0	0	6	Gr.	
0	0	0	0	0	0	0		8	Gr.	
8	7	6	5	4	3	2	1			

No. 15.

							0	1	Pur.	
					0			3	Pur.	**Purple Warp shows below.**
			0					5	Pur.	
	0							7	Pur.	
0	0		0		0		0	2	Gr.	
	0	0	0		0		0	4	Gr.	**Red weft shows above.**
	0		0	0	0		0	6	Gr.	
	0		0		0	0	0	8	Gr.	
8	7	6	5	4	3	2	1			

No. 16.

0		0		0				1	Pur.	
0		0				0		3	Pur.	**Yellow weft shows above.**
0				0		0		5	Pur.	
		0		0		0		7	Pur	
0		0	0	0	0	0	0	2	Gr.	
0	0	0		0	0	0	0	4	Gr.	**Green warp shows above.**
0	0	0	0	0		0	0	6	Gr.	
0	0	0	0	0	0	0		8	Gr.	
8	7	6	5	4	3	2	1			

The weft of Nos. 14, 15, and 16, is inserted in the same order as in No. 13. It will also be found by examining the cording of No. 13, that three-fourths of the red weft will be flushed over the green warp on the upper side of the cloth; and, also, that three-fourths of the yellow weft is below the purple warp on the under side: so that the greatest portion of each weft will be displayed on the surfaces of the cloth, while the two warps will be nearly concealed in the centre. In No. 14, this order is reversed, and the two warps appear to most advantage: and so of the other examples.

Double cloth is also woven for the purpose of making pillow cases, to avoid the seams at the selvages; a plan of the mounting of which is as follows:—

No. 17.

0	0							1
	0	0						3
		0	0					5
0			0					7
0	0	0	0	0	0			2
0	0	0	0	0			0	4
0	0	0	0			0	0	6
0	0	0	0		0	0		8
8	6	4	2	7	5	3	1	

All that is to be observed in this mounting is, that the tweel of one web may run in the contrary direction from the other, so that no interruption may appear at the selvages. Were this not the case, the tweel at each selvage would resemble what is usually termed the herring bone.

Nearly allied to double cloth, is a kind of tweel which shows two different colours of weft on the cloth, one on each side, and which are chiefly employed in the manufacture of silk stuffs. The two following plans are examples of this species of tweeling:—

No, 18.

0		0			0	1 1
0			0	0		2 2
	0	0		0		3 3
6	5	4	3	2	1	
Blue Shot.	White Shot.	Blue Shot.	White Shot.	Blue Shot.	White Shot.	

No. 19.

0		0		0			0	1 1
0		0			0	0		2 2
0			0	0		0		3 3
	0	0		0		0		4 4
8	7	6	5	4	3	2	1	
Blue.	White.	Blue.	White.	Blue.	White.	Blue	White.	

In No. 18, which may be called a three leafed double tweel, the white weft will appear to most advantage on the upper side of the cloth, while in the loom. The same is to be understood of No. 19, which is a four leafed double tweel.

On this principle many of the goods manufactured at Spittalfields are woven; and also a fabric which is an imitation of what are called Angola shawls. These shawls have their warps of strong cotton yarn, generally double, and twisted, or what is called net warp, and the weft is sometimes cotton rove, and sometimes woollen, one half white and the other gray; a shot of each colour being thrown in alternately as in No. 19: the four leafed tweel being commonly employed for this purpose. When the fibres of the rove are raised in the process of dressing, they form a fine long shag, somewhat resembling felt. This plan, however, can only produce a plain fabric, of two different colours, one on each side: but when figures are formed on these shawls, agreeably to any particular pattern, recourse must be had to the draw loom, when they take the name of double dumb flowers, or double damask, under which head they will be farther explained.

If the rove is to appear on one side only, the other side may be woven plain, and common weft thrown in. This will be effected by the annexed plan of mounting.

No. 20.

	0				0	1	1
0				0		2	2
	0		0			3	3
0		0				4	4
4 8	2 6	7	5	3	1		

CHAP. VI.

THE MANUFACTURE OF CORDUROYS, VELVETS, THICKSETS, &c.

As this branch of manufacture has never been carried to any great extent in Scotland, where, consequently, it can be but little known, some account of the several processes which are employed to bring these goods from the yarn to the finished state, will not, perhaps, be uninteresting to the intelligent reader.

The setts of reed in which corduroys, velvets, velveteens, &c. are generally woven, are Nos. 32, 34, 36, and 38: that is, 32, &c. beers, of 19 dents or splits each in 24½ inches. It is usual, however, to fill only about 33 beers, of 19 dents, of a 34 reed, and about 35 beers of the 38 reed, for corduroys; but velveteens have from one beer upwards more than cords, on account of being more liable to shrink by the breadth, in the subsequent processes.

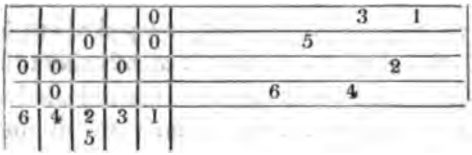
The web, or piece, is generally warped about 58 yards in length; and, when finished, will stand about 56, or 56½ yards. The warp of a 34 reed, for example, is No. 32 mule yarn, doubled and well twisted; and two of these double ends make a splitful or dent. The weft, which is about No. 22 or 24, is thrown in single. There is a kind of cotton velvet, for ladies' pelisses or mantles, which is woven in No. 50 reed, or 50 beers in 28½ inches; the warp of which is No. 52 doubled, and weft No. 52 single.

These warps are all well dressed, and dried by running a hot iron over them, before they are put into the loom. The weaver is not paid by the ell, or yard, as in other branches of weaving, but by the quantity of weft he throws into the web. For example, weft about No. 24 is generally paid 21d. per pound, weaving and winding.

In these, as in some of the other species of fancy weaving, considerable ingenuity is displayed in the production of patterns, which, in general, exhibit a variety of flushing peculiar to themselves. This will be obvious from a perusal of the specimens subjoined to these descriptions. The ground, or back, as it is generally termed, is sometimes plain and sometimes tweeled. In the former case it is called a tabby or plain back, and in the latter, a jean or Genoa back; and the jeans are single or double, according as they are woven in a three or four leafed tweel mounting. The flushing, which is afterwards cut up to form the ridges, is thrown in, and interwoven with the ground at various intervals; and upon this depends all that diversity of pattern which we see in these fabrics. A few examples will illustrate these observations.

A PLAIN, OR TABBY BACK VELVET.

No. 1.



If we examine this plan, we will find that the treadle marked 1, or the first in the order of treading, will raise all the odd threads, 1, 3, 5, in the draught, and the treadle marked 4 will raise all the even ones: consequently, these two treadles, wrought alternately, will produce plain cloth; or, in other words, they will work the ground or back. The other three treadles are for the flushing By tracing over the treading it will be found, that there are two shots of the flushing thrown in for each shot of the ground, which are marked 2, 3, 5, 6, in the succession of treading; the treadle 6, being the same as 3, is added merely to keep the treads alternate, when both feet are employed on the treadles.

The following plan is an example of a

SINGLE JEAN BACK VELVET CORD.

No. 2.

	0			0		1
				0	0	2
	0	0			0	3
0	0		0	0		4
				0	0	5
	0				0	6
8	6	4	2	3	1	
12	14	7	5	11	9	
		10	15			
		13				
		16				

In this plan, the treadles on which the figures 1, 3, and 6, are marked, are for weaving the back, it being the single jean, or three leafed tweel: but as each shot of the flushing weft floats over five threads of warp, and is only interwoven with the sixth, two sets of tweeling leaves are necessary, in order to extend the draught to that range. In the present example we also find, that there are ten shots of flushing weft thrown in for six of the back; and these ten shots are interwoven with the warp threads 3 and 4 in the draught, and the flushed space afterwards cut up by the plough.

The following example shows how the draught and cording of a three leafed tweel are distributed on four leaves; the ground treadles being 1, 3, and 6.

GENOA BACK VELVERET.

No. 3.

	0			0		4 1
	0					5 2
0			0	0	0	6
		0		0	0	3
8 12	6 14	4 7 10 13 16	2 5 15	3 11	1 9	

A four leafed tweel adapted to six leaves.

DOUBLE JEAN CORD.

No. 4.

0	0					1
0			0			2
		0	0			7 3
	0	0				8 4
0	0			0		5
0			0		0	6
2	4	6	8	3 7	1 5	

In this plan of corduroy, it will be observed, that there are eight threads of warp, or two sets of a four leafed tweel drawn upon six leaves, to which the cording on the treadles 2, 4, 6, 8, will be found to correspond. Out of these eight threads, only the two, numbered 5 and 6, are interwoven with the flushing, leaving six for the furrow. Now these two threads, 5 and 6, form the base or centre of the ridge, after the flushing is cut on each side, and raised by the process described farther on.

From these, and the following collection of patterns, considered the best of their kinds in present use, the reader will be enabled to form some idea of the methods by which the varieties in this branch of weaving are produced, to pursue which any farther, in this manner, would only be losing time, as the most complex pattern in this collection, may be analyzed, by tracing the ground and flushing separately.

FOUR PATTERNS OF THICKSET CORDS, TABBY BACK.

No. 5.

				0	5 3 1
	0	0			4 2
0			0	0	9 7
	0				10 8 6
6	4	2 3	3	1	

No. 6.

0			0	0	3 1
				0	5
	0				2
	0	0			6 4
6	4	2 5	3	1	

No. 7.

0					8
0		0			6 4
			0		5 2
	0		0	0	7 3 1
6	4	2 5	3	1	

No. 8

0			0	0	5 3 1
	0				4 2
				0	9 7
	0	0			10 8 6
6	4	2 5	3	1	

VELVERET.

No. 9.

	0	0			1
				0	4 2
	0				5 3
0			0	0	6
6	4	2 5	3	1	

VELVET.

No. 10.

	0				5 3 1
	0	0			9 7
0			0	0	4 2
			0		10 8 6
6	4	2 5	3	1	

FOUR JEAN BACK THICKSETS.

No. 11.

	0	0		0		1
				0	0	2
	0	0			0	3
0	0		0	0		4
				0	0	5
0	0		0		0	6
8 12	6 14	4 7 10 13 16	2 5 15	3 11	1 9	

No. 12.

			0	0		1
				0	0	2
	0		0		0	3
		0	0	0		4
	0			0	0	5
		0	0		0	6
	4 8 12	2 6 10	5 11	3 9	1 7	

No. 13.

		0		0	0	1
	0				0	2
	0	0		0		3
0			0	0	0	4
	0				0	5
0	0		0	0		6
8 12	6 14	4 7 10 13 16	2 5 15	3 11	1 9	

No. 14.

				0	0	1
	0				0	2
	0			0		3
				0	0	4
	0	0			0	5
0	0		0	0		6
8 12	6 14	4 7 10 13 16	2 5 15	3 11	1 9	

TWO TABBY VELVETEENS.

No. 15.

					0	1
0			0			2
					0	3
		0	0	0		4
					0	5
	0		0			6
4 8	2 6	7	5	3	1	

No. 16.

					0	1
					0	3
					0	5
0			0			2
		0	0	0		4
	0		0			6
4 8	2 6	7	5	3	1	

FOUR JEAN BACK VELVETEENS.

No. 17.

0			0			1
	0		0		0	2
0					0	3
0		0	0			4
			0		0	5
0				0	0	6
7	5 9	3 8	4	2 6	1	

No. 18.

0				0		1
	0			0	0	2
0					0	3
0		0		0		4
				0	0	5
0			0		0	6
7	5 9	3 8	2 6	4	1	

No. 19.

0			0			1
0					0	3
			0		0	5
	0		0		0	2
0		0	0			4
0				0	0	6
7	5 9	3 8	2 6	4	1	

No. 20.

0				0		1
0					0	3
				0	0	5
	0			0	0	2
0		0		0		4
0			0		0	6
7	5 9	3 8	4	2 6	1	

In these four plans, it will be observed, that the treading is not wholly alternated; for, in Nos. 17 and 20, the treadles 1 and 2 are placed together, at the right side, and therefore must be wrought in succession by the weaver's right foot. The same will be observed of the treadles 2 and 3 in Nos. 18 and 19, which are placed to answer the weaver's left foot. In the former case, he is said to hop with his right foot, and in the latter with his left.

CORDS.

QUEEN'S CORD.

No. 21.

				0	7 3 1
	0	0			10 4
0			0	0	9 5
	0				8 6 2
6	4	2 5	3	1	

CORDED VELVET.

No. 22.

0					11 9 3 1
0		0			13 7 5
	0		0	0	14 8 2
			0		12 10 6 4
6	4	2 5	3	1	

JEAN BACK VELVET CORD.

No. 23.

	0			0		1
				0	0	2
	0	0			0	3
0	0		0	0		4
				0	0	5
	0				0	6
8 12	6 14	4 7 10 13 16	2 5 15	3 11	1 9	

DOUBLE KING'S CORD.

No. 24.

		0	0		0	1
	0		0			2
0	0	0				3
		0	0			4
	0		0	0		5
	0	0				6
2 6 10	4	8	12	3 7 11	1 5 9	

NEW DOUBLE JEAN CORDS.

No. 25.

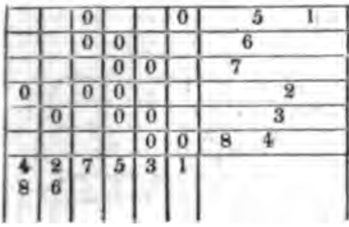
	0			0		5 1
				0	0	6 2
0					0	3
0	0					4
0			0		0	7
0	0	0				8
8	6	4 7 10	2 5 9	3	1	

No. 26.

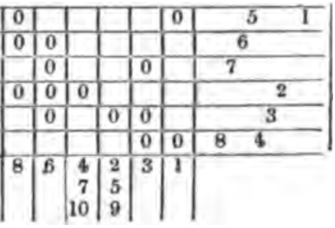
0	0					1
	0		0			2
0					0	7 3
				0	0	8 4
0	0	0				5
	0		0	0		6
8	6	4 7 10	2 5 9	3	1	

OLD DOUBLE JEAN CORDS.

No. 27.

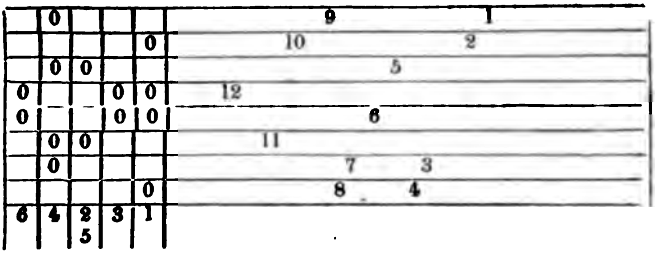


No. 28.



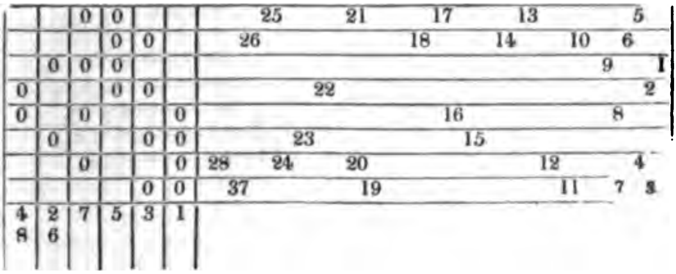
TABBY CORD IN THE EIGHT SHAFT DRAUGHT, FLOATING 6 AND 4.

No. 29.



AN EXCELLENT EIGHT SHAFT CORD, FLOATING 5 AND 7.

No. 30.



A SEVEN SHAFT CORD.

No. 31.

	0			0		7 1
				0	0	8 2
	0				0	12 9 6 3
0	0		0	0		4
0			0	0	0	11
		0		0	0	5
	0	0		0		10
8 12	6 14	4 7 10 13 16	2 5 15	3 11	1 9	
		17				

The above cord stands round and finishes well; and by adding the shot 17, below the line on the treadles, it will take on more weft. The same is to be understood of any other treading, which is marked in this manner.

LITTLE EIGHT SHAFT CORD.

No. 32.

0	0					9 1
	0			0		10 2
0	0	0				5
0		0			0	12
	0		0	0		6
			0	0	0	11
				0	0	7 3
0					0	8 4
8	6	4 7 10	2 5 9	3	1	
		12	11			

OLD MUD, OR ADDINGTON CORD.

No. 33.

0	0					9 1
	0			0		10 2
0	0					5
0		0			0	12
	0			0		6
			0	0	0	11
				0	0	7 3
0					0	8 4
8	6	4 7 10	2 5 9	3	1	This should be woven in a 38 reed.

NEW MUD, OR ADDINGTON CORD.

No. 34.

0	0					9 1
	0			0		10 2
0	0					5
0					0	12
	0	0		0		6
				0	0	11
				0	0	7 3
0			0		0	8 4
8	6	4 7 10	2 5 9	3	1	

MELLOR'S UNION CORD, FLOATING 8 AND 10.

No. 35.

	0			0		18 14 10 6
				0	0	19 15 7 3
0	0	0				1
	0		0	0		2
			0	0	0	11
0		0			0	12
0	0					17 13 9 5
0					0	20 16 8 4
8	6	4 7 10	2 5 9	3	1	
		12	11			

When the shots 11 and 12 are added, this cord will take 10 oz. weft to a yard. This is a round top cord and finishes well.

OLD CONSTITUTION CORDS.

No. 36. No. 37.

0	0						9 1	0	0					
	0				0		10 2		0				0	
0	0		0				5	0	0		0			
0						0	12	0						0
	0	0		0	0		6		0			0	0	
					0	0	11						0	0
					0	0	7 3						0	0
0		0				0	8 4	0		0				0
8	6	4 10	5 9	2 7	3	1		8	6	4 10	5 9	2 7	3	1

NEW CONSTITUTION CORD.

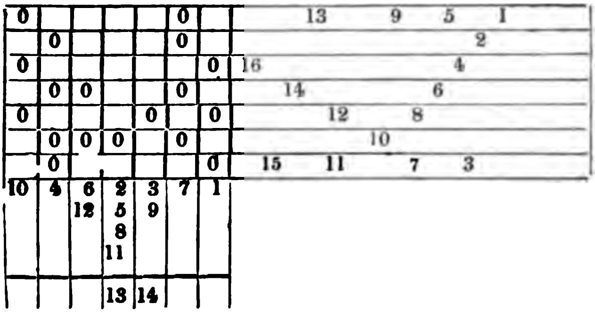
No. 38.

This cord has a round top, and when woven in a 38 reed, will take 10 oz. weft per yard.

	0			0		18 14 10 6 2
0	0					17 9 1
		0		0	0	15 3
0	0		0			13 5
				0	0	19 11 7
0					0	20 16 12 8 4
8	6	4 7 10 12	2 5 9 11	3	1	

NEW HUNTER'S CORD.

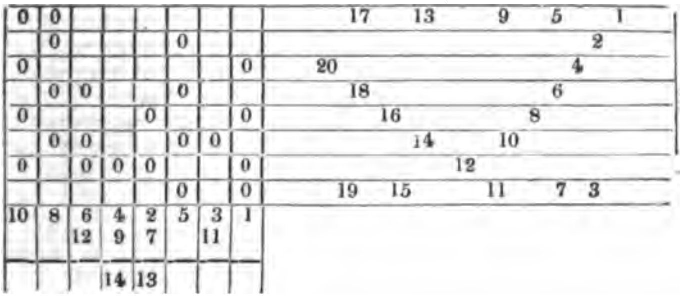
No. 39.



This is a 16 end cord, for a 34 reed; but, when the two shots 13 and 14 are added, it will do for a 38 reed, and take more weft.

NEW BANG-UP CORD.

No. 40.



NEW IMPERIAL CORD.

No. 41.

	0			0		14 10 6 2
0	0				0	13 9 5 1
		0		0	0	3
0			0		0	4
0		0			0	12
			0	0	0	11
				0	0	15 7
0					0	16 8
8	6	4 7 10	2 5 9	3	1	
		12	11			

This is a very round top cord, and finishes well.

NINE SHAFT CORD, RAISING THE TUFT SHAFTS TOGETHER.

No. 42.

	0			0		28 22 16
				0	0	26 23 17
	0	0		0		
		0		0	0	20
	0	0			0	30 24
0			0	0	0	29
0	0		0		0	15
0	0		0	0		25 19
	0				0	27 21 18
8 12	6 14	4 7 10 13 16	2 5 15	3 11	1 9	
		31	17			

No. 42, CONTINUED.

13 7 1
11 8 2
10 4
14
5
9
12 6 3

EIGHT SHAFT CABLE CORD.

No. 43.

0						0		17 13 9 5 1
	0					0		2
0							0	20 4
	0	0				0		18 6
0				0			0	16 8
	0	0			0	0		14 10
0		0	0	0			0	12
	0						0	19 15 11 7 3
10	4	6 12	5 11 14	2 8 13	3 9	7	1	

TEN SHAFT CABLE CORD.

No. 44.

0							0	17 13 9 5 1
	0					0		6 2
0						0		19 15 11 7 3
	0						0	8 4
0				0		0		10
	0				0		0	12
0			0	0	0	0		14
	0	0		0			0	16
0					0	0		18
	0			0			0	20
10	4	6 12	2 8	5 11	3 9	7	1	

THE BOLD CABLE CORD.

No. 45.

	0					0				34				30				26				22				18
0	0										33															
					0	0	0						31													
0	0			0	0										29											
			0	0	0	0	0										27									
0	0	0		0	0														25							
				0	0	0	0														23					
0	0				0																		21			
						0	0		35																19	
0							0	36				31				28				24				20		
8	6	4 10	2 7	5	9	3	1																			
			12	11																						

No. 45, CONTINUED.

		14				10				6				2	
17															1
													3		
											5				
									7						
							9								
					11										
			13												
	15														
16				12				8				4			

FINISHING CORDUROYS AND VELVETS.

Velvets and corduroys, after they come out of the loom, have their flushed parts cut up, the former into a uniformly smooth surface, and the latter into ridges. The piece is spread, for this purpose, on a long table, and the person who conducts this process runs the point of a sharp instrument, called a plough, along each furrow, or centre of each flushed stripe. The piece is then exposed on a table, to the action of a pair of strong brushes, which are driven across the ridges by machinery, with a reciprocating motion. At each end of the table is a roller, on one of which, the cloth is wound before the operation, and the other, with a very slow motion, receives it as it comes from the brushes. The use of this process is to raise the pile, and form the cut flushing into ridges above those parts which are incorporated with the warp. When the piece has passed through this machine, the loose fibres are singed off, by drawing its surface over a cast-metal cylinder made red hot. The piece is then immersed in hot water, and rubbed well with a hand brush; after which it is dried, singed, and again put through the brushing machine; all of which operations being repeated three times in the same order of succession.

The piece is next put into a tubful of hot water, with which are mixed a little vitriol and pearl ashes. This ley is called a chemic. When it is taken out of the chemic, it is spread on the grass, where it lies two or three days, when it is again put through the chemic, and rubbed well with the hand brush, to remove any fire stains or brown spots that may be remaining. Two or three days more exposure to the air on the green, will prepare it for dying the darker colours; but for the lighter shades, it will require a little more bleaching.

PROCESS OF DYEING CORDUROYS, &C.

The utensils used in dyeing these fabrics upon a small scale, are a pan or boiler as large as the half of an oil pipe, a scoop, or tin laddle with a long handle, and several tubs of a size sufficient to hold a piece and as much liquor as is requisite to work it in.

Then, for dark olive, take one scoopful of fustic, and one scoopful of shumac, and two scoopfuls of logwood cut small. Fill the pan nearly full of water, into which put the fustic, and boil it for an hour fully. Boil the shumac and logwood separately in the same manner, and put their respective liquors into separate vessels for use.

Dissolve a quart of copperas in about 20 quarts of boiling water. Dissolve also, a quart of blue vitriol in the same quantity of hot water in another tub. This done, take 9 scoopfuls of the fustic liquor, seven scoopfuls of the shumac liquor, and one scoopful of the logwood liquor, and mix them well together in a tub. Wet the piece which is to be dyed, thoroughly in warm water, to make it take on the colour evenly, then work it well in the above mixture for about an hour, turning it round regularly upon a small wench. Take some warm water in a tub, and add to it one quart of the copperas liquor. Work the piece in this for about half an hour. It is next washed clean in hot water, and then soaked and rinsed well in a tubful of the fustic liquor taken by itself; after which, it is again put through the dye mixture as at first.

If the cloth is for a dark colour, more logwood is now added to the first mixture. Take some warm water in a tub, and add to it one quart of the copperas liquor, and one quart of the blue vitriol liquor; in this it is well worked, and afterwards washed in warm water. It is now run through a tubful of the fustic liquor, adding fresh liquor, if necessary.

These operations are to be repeated as often as is requisite to give the piece the intended shade of colour. They are in general repeated five times. The tubs are all emptied, and a new mixture of the dye colours prepared, as at first, before the last operations; previous to which, it must also be well soaked in the fustic liquor. In this last dye liquor, the shumac is omitted; and, when the shade is to be dark, the logwood prevails; but when light, the fustic.

After passing through the dye liquor for the last time, it is wrought in hot water mixed with a quart of the vitriol liquor to green it. Wash it now well in warm water, and it is finished.

To give the piece a glossy appearance, and raise the pile, it is rubbed over with bees wax, and afterwards polished with a smooth stone.

TO DYE A LEAD COLOUR.

Take a scoopful of shumac liquor, a scoopful of fustic liquor, and about a quarter scoopful of logwood liquor, mix them well together, and add water till the tub be about half full. In this the piece is to be well wrought. Take half a tubful of warm water, into which put a pint (half a quart) of copperas liquor. Put the cloth through this, and afterwards wash it in warm water, and it is finished.

TO DYE A SILVER DRAB.

Take two scoopfuls of fustic liquor, and one of shumac liquor, mix them well with warm water till the tub be about half full, then dye the piece. Work it well again in about half a tubful of warm water mixed with a pint of copperas liquor, after which, wash it well in warm water. Sometimes two or three drops of the oil of vitriol are added, the last time it is washed.

Such are the processes commonly employed to prepare these goods for the market; though of late, some of the smaller patterns are sold in the uncut state, especially those which are woven in the power looms; not, however, by the yard, but at so much a pound weight, which is a great inducement to make a substantial fabric.

PLUSH VELVET.

Plush velvet or shag, is woven on a principle something different from any of the preceding fabrics. It consists of two warps, one called the main warp or ground, which is commonly made of hard silk, and the other, the pile warp. These warps are beamed on separate rolls, the latter being placed below the former.

When the heading or end of the piece is woven, the weaver raises the pile warp, which is drawn on a separate leaf from the ground, and into this shade he introduces a wire, which is longer than the breadth of the cloth. A few shots of the ground is woven and another wire introduced, and so on with a third wire. In each of these wires is a groove, along which, the weaver runs the point of a sharp instrument called a truvet, which cuts the pile, and relieves the wires in succession. The first wire, therefore, when thus relieved, is again put into the fourth pile shed; and after a few shots of the ground are woven, the second wire is inserted into the fourth pile shed; and this operation is repeated till the piece is finished. The pile warp is commonly made of softer silk than the warp, or of a fine kind of goat's hair, and the surface of the shag is afterwards cut evenly and smooth with a pair of shears. On this principle, is woven that fabric which is made into hats.

CHAP. VII.

CROSSED WARPS.

This branch of weaving comprehends all that variety of texture whose warp threads, or any portion of them, do not lie parallel to each other in the cloth, but are either twisted together like a cord between the shots of weft, or otherwise crossed in front of the reed.

SECT. I. PLAIN GAUZE AND ITS VARIETIES.

This is the most simple, as well as the most extensively useful branch of cross-weaving; and as it may be considered the basis of all the other varieties, a minute description of its mountings and process of weaving will be necessary, especially as no idea of the other branches can be rightly formed without some previous knowledge of its principles.

The mounting of a plain gauze consists of two back leaves of common heddles, two plain front leaves, called standards, and two half leaves, called doups. The two back leaves are placed about three inches behind the standards; and the half leaves are placed, one behind the upper half of the back standard, and the other in front of the under half of the fore standard. Hence, the former of these half leaves is usually denominated the upper or back doup, and the latter the under or front doup. Each half heddle, bow, or doup, of the upper half leaf, passes through the under part, or below the clasp of its respective standard; and each doup of the under half leaf, passes through the upper part of its standard, as represented in Figs. 2 and 3, plate 5, where C is the back standard, and 1 its doup; and D is the front standard, and 2 the under doup. Fig. 1 of the same plate, is a front view of the fore mounting of a gauze, the back leaves being omitted. *a* shows the position of the under doup shaft, *ee*, the shafts of the fore standard, *i* is the shaft of the upper doup, and *oo* the shafts of the back standard; *w*, *x*, are weights suspended from the half leaves, to keep them tight to their standards in the cross shed, or when the doups and standards are in the position represented in Fig. 3, and to relieve them when the open shed is formed as in Fig. 2.

Fig. 4 is the draught and cording of a plain gauze. A and B are the back leaves or back mounting. C and D the two standards, 1 and 2 the upper and lower doups. Two treadles only are necessary for plain gauze: but when plain texture is required, another treadle is added for that purpose. In this plan the treadle for the cross shed is marked *c*, that for the open shed *o*, and the plain treadle is marked *p*. The same letters placed at the ends of the shots of weft in the specimen of cloth annexed, refer to the treadles which open their respective sheds.

TO DRAW OR ENTER A GAUZE.

It has been already noticed, that each doup of the hal. leaves 1 and 2, pass through the opposite parts of their respective standards. They are kept in this position until the warp be entered, by round rods, which are introduced into their loops or bows, as represented by the dots in the Figs. 2 and 3. The draught, Fig. 4, contains three splitfuls of gauze warp, one thread of which being marked *i*, and the other *o*, the first thread *i*, of each splitful, is taken through the under part, or below the clasp of a heddle on the back leaf A, and the other thread *o*, is taken through the upper part, or above the clasp of a heddle on the back leaf B; so that both these leaves can produce only one shed. When the whole of the warp is drawn through the back heddles in this manner, a new lease is formed in their front, for the purpose of drawing the warp again through the front mounting. One shed of this lease is obtained by raising the leaf B and sinking the leaf A with the hand. The other shed is forced through the leaves from the rod which is in the contrary shed behind.

When the new lease is thus obtained, the yarn roll with the back leaves are suspended, in the usual way, to the top of the loom, and the entering commences anew through the front mounting. The thread *i*, which was drawn through the under part of the leaf A, and which is the first that occurs in the lease, is again taken through a doup of the half leaf 1, in the same opening with the rod above mentioned, or where the dot is placed in the Fig. The other thread *o*, which passes through the upper part of the leaf B, is, in like manner, taken through a doup of the half leaf 2, facing the former doup, between the standards: and this finishes the draught of one splitful. This process is to be repeated until all the warp is entered; after which, the rods that were between the mountings, and those in the doups, are taken out.

In this process it may be observed, that the threads *i* and *o* are not actually crossed in the drawing; for, as the thread *i* is taken through the back heddle to the right of the thread *o*, and is afterwards drawn through the upper doup which is on the left of it, these two threads will naturally cross each other between the mountings, the thread *i* above the thread *o*, when the warp is stretched in the loom. To effect this, it is only necessary to set aside the fore doup and standard in drawing each splitful, until the thread *i* be taken into the upper doup, after which the thread *o* will come into its proper place. But it is more expeditious, when the under doup is picked out, to put the middle finger of the right hand through the loop of it, and then the fore finger of the same hand into the loop of the upper doup; then the person who gives in the warp has only to put the first thread *i* on the fore finger, and the thread *o* on the middle finger, of the person who draws in the warp, and he takes both threads through at one time.

When any portion of the warp is to be woven into the plain texture, such as the selvages, stripes, or borders of handkerchiefs, it is drawn without being crossed between the mountings; that is, the thread *i* is drawn through the under part of the leaf A, and the thread *o* through the upper part of the leaf B, as in the gauze part; but the thread *i* is afterwards drawn through the under doup 2, and *o* through the upper doup 1, parallel to each other.

The doups and standards here described have been long in use, and are still employed on occasions; but another form has been recently introduced, which is considered an improvement in gauze weaving. The standard is made with an eye instead of the common clasp, and one half of the doup runs through it, the other half, or side, being either above or below the clasp, according as it is in the fore or back standard. This will appear by consulting Fig. 5; in which the dots point out where the warp threads pass through the doups. The round rods which were used in the doups of the former mounting, are unnecessary in this, as the clasps of the standards are always in the loops of the doups, and keep them sufficiently open. The warp is taken through this mounting in the same manner as the former, observing to keep the doups slack, that they may be easily taken through their standards.

These standards are considered to possess several advantages over the others, particularly in taking off the friction when the cross shed is forming, although the weaver should employ both of his feet on the treadles, which is not the case in the first form. The eyed standards also prevent the doups from falling out of their places when any of the warp threads are broken, which, in the other mounting, frequently occasions some trouble and breakage before they can be replaced.

As it is customary to make use of four leaves of heddles in weaving the finer setts of plain cloth, to prevent the friction occasioned by crowding too many of the clasps together; so in gauze weaving it has been found advantageous, for the same reason, to cast the upper halfs of the fore standards, and under halfs of the back standards on two shafts; by which means the doups are more scattered, and pass each other much easier than in the other mountings. Mountings made in this manner are said to have clifted standards.

TO MOUNT A GAUZE.

Gauze is commonly mounted with coupers, long and short marches, which have been explained in the first chapter; although jacks be sometimes employed for the back leaves. Each upper shaft has its respective couper and long march for moving it, and each under shaft has its short march; and all these connexions are formed in the manner already described. This done, it only remains to tie up the treadles and apply the doup weights.

By referring to Fig. 4, Plate 5, it appears that there is a dot where the treadle *c* crosses the standard D, and a cross where the same treadle crosses the standard C. The dot shows that the standard D is raised by this treadle, and the cross, that the standard C is sunk. A cord is therefore taken from the long march of the leaf D, and another from the short march of the leaf C, to this treadle, the blank squares denoting that no connexions are there necessary.

On the treadle *o* there is a raising mark for the standard C, and another on the back leaf B, while there is a cross or sinking mark on the standard D, and another on the back leaf A; which indicate that the two former are raised, and the two latter sunk by this treadle. On the treadle *p* there is a raising mark in the upper doup 1, and a sinking one on the under doup 2. These connexions are therefore all formed in the same manner as on the first treadle.

When a gauze web is justly mounted, the plain shed should stand a little open, generally from a half to three-fourths of an inch, that the doups may be kept clear of each other, or to allow them sufficient time to pass from the slack to the tight state before the succeeding shed is opened. This is effected by raising the back doup and standard a little, by the snitches above, and depressing the front doup and standard in the same manner, and tempering all the foot cords accordingly, before the justers are taken down.

It is observable in the gauze mounting, that, as the under half leaf has neither couper nor long march, nor the upper one a short march, no connexions can be formed by these means between them and the treadles. As the open shed, however, is formed merely by the two back leaves, the doups being all slack; and the cross shed, by the two standards, the doups being tight, See Figs. 2 and 3, these changes are regulated by two small weights suspended from their respective marches, as represented in Fig. 1. The weight *w* is suspended from the short march *u* of the under doup, and is tied to a small piece of wood *c*, commonly a piece cut off an old bobbin, which rests in the open shed on the front long march; but in the cross shed, the whole of the weight is transferred to the short march *u*, by which the doups are kept tight to their standards. In like manner the weight *v* is suspended from the third short march, counting from the front, which is connected to the back standard, and is tied to a similar piece of wood which rests occasionally on the third long march, or that which is connected to the upper doup. Hence it follows, that in the open shed the back standard is raised, which takes the whole of the weight, by means of its short march, off the long march of the upper doup, which is thus left in the slack state. In the cross shed, however, the back standard is sunk, which leaves the weight wholly on the long march of the upper doup, and keeps it in the tight state.

Hence it is evident, that when the back leaf A is sunk, and the leaf B raised, See Fig. 4, a shed is formed by these leaves; and as the back standard is likewise raised and the front one sunk, which take all the weight off their respective doups, these doups will be slack and crossed by the action of the warp, as represented in Fig. 2, and the thread *i* will sink on the right of the thread *o*. But when the fore standard is raised and the back one sunk, which is effected by the treadle *c*, the weights are all upon the doups, which keep them close to their standards; and therefore the thread *i* is now sunk on the left of the thread *o*, which forms the gauze texture represented in the Figure. As the warp which is drawn on the upper doups always sinks, and that on the under ones constantly rises in weaving plain gauze, it will follow, that the plain treadle, wrought alternately with either of the other two, will produce plain cloth. But as the selvages are generally woven plain, which is effected by drawing them without crossing, the cross treadle, which reverses the motion of the standards, must be chosen for this purpose. This will evidently appear by comparing the few shots of plain, in the specimen before us, with the gauze twists.

The back and front mountings of a gauze, should stand about three and a half to four inches separate, that the cross shed may be freely formed, without straining the warp. Particular attention is also necessary in adjusting the doup weights; for, if they were too light, the doups would project through the standards in the cross shed, and produce a considerable deal of attrition, with a grating noise which is known among tradesmen by the name of *crunching:* and were the weights too heavy, they would draw the doups backwards through their standards and strain the warp. Should the rubbing and noise continue after the web may be considered justly mounted, they will often be removed by shifting the cord which connects the under doup shaft to the first short march, a little to one side. There is no rule for determining the precise weight which is to be applied to each half leaf; for this will, in general, depend on the quantity of warp in the web, and the distance at which the weight is suspended from the centre of motion.

These are the mountings which are in common use for weaving plain gauze, or when little other mounting is requisite; but there are other methods of producing the gauze twist which require explanation, as they are occasionally adopted in different kinds of fancy weaving. And first, of

WEAVING GAUZE BY THROUGH-PUTS.

The original method of weaving gauze, at least that by which it was woven in Paisley before the doups were introduced, was by a mounting similar to that now in use for weaving the false spider net. This mounting consisted of a back leaf of eyed heddles, and the two standards C and D, Fig. 6, with two under doups facing each other, and connected together between the standards by an eye, where the bead is placed in the present Fig. One thread of each splitful was drawn through the eye of a heddle on the back leaf, and passed between the standards immediately above the eye. The other thread had no back heddle, but was drawn through the eye which connected the doups.

In weaving gauze by this mounting, the thread which was drawn on the back leaf was sunk at each tread, while the other thread was raised to the right and left of it, alternately, by the standards. Thus, by raising the standard C and sinking D, the doup 1 was tight, and the other, 2, being slack, yielded to the motion of the rising standard, by which the thread in the eye of the doup was raised to the left of that in the back leaf. By raising the standard D and sinking C, the threads in the doups were raised to the right of those on the back leaf, and so on alternately.

Plain texture was produced by sinking both standards and raising the back leaf for the plain shed, which could be reversed by any of the other two. These doups and standards were known by the name of through puts: they have long ago been superseded by the doups and standards formerly explained, though they are now employed for spidering, which will be treated of in its proper place.

WEAVING GAUZE BY A BEAD LAM AND STANDARD.

This mounting, which is sometimes employed for the gauze part of nets, consists of two back leaves of eyed heddles, a standard and an upper half leaf of doups, which are called bead lams, from their having small glass beads in their loops or bows, to avoid the friction of the warp passing through them.

Fig. 7. is a plan of this mounting, in which *m* and *n* are the back leaves, *b* the standard through which the bead lams pass, in the same manner as in the other gauze mountings. The two threads *o* and *i* which pass through the same interval of the reed, are drawn through the eyes of the heddles on the back leaves *m* and *n*; and the thread *i* is afterwards taken through the bead *x* of its respective bead lam or doup. The thread *o* has neither doup nor standard.

The open shed of this mounting, or slack state of the bead lams, is shown by the three splitful of warp marked A, Fig. 7. and the bead lam *x*, one seen passing below the threads *o*, and rising to the right, as represented at A, Fig. 8, which is an elevation of the bead lams and apparatus for working them. This shed is opened by raising the back leaf *m* and sinking *n*, the bead lams being slack, and yielding to the warp. The cross treadle sinks the two back leaves, by which all the warp is taken down to the race rod; at the same time the bead lam shaft *b* is raised, the lams being tight: and consequently, the threads *i* are now raised to the left of the threads *o*, as represented at B. See Figs. 7 and 8.

As that half of the warp which is drawn through the bead lams, is forced up in forming the cross shed, while the other half remains on the race rod; to prevent it from being too much strained at this tread, it is beamed on a separate roll, and slackened more than the other, when the cross treadle is pressed down. Sometimes the standard is omitted, which reduces the mountings to two back leaves and a single half leaf of bead lams; but the taking in of the warp, and the opening of the sheds, are the very same as when the standard is employed.

In this method of weaving gauze, it will be observed, that, in forming the open shed, the bead lams must be so much slackened as permit them, not only to sink to the race rod, but to rise again to the upper part of the shed, after passing below the other thread of the same split. The bead lams are therefore made considerably deeper than the doups formerly described; and nearly double the perpendicular range is given to the bead lam shaft. Fig. 8 is a view of the apparatus for giving this additional range, which consists, simply, of the two short marches *a* and *b*, with their centres reversed. The under shaft *p* is connected to the under shaft *d*, by the two cords *v* and *w*, which are called bridles. The under shaft is tied to the short march *b* in the usual way, which is again connected by the cord *y* to the other short march *u*, the centre of which is at the opposite part of the loom; and this last march is tied to the treadle *t*. In every other respect, the shaft *p*, when the standard is employed, is mounted like the upper doup of a common gauze: and when the standard is omitted, the bead lam shaft is mounted with a couper and long march, to the latter of which, a small weight is suspended, to keep the lams moderately tight.

It is now plain, that when the treadle *t* is pressed down, the perpendicular range of the shaft *p* will be increased, in proportion as the cord *y* is tied nearer to the end of the lowest march; and consequently, when a greater range is required, it is only necessary to shift the cord *y* toward the right, and the contrary when it is less; by which means, any proposed range may be obtained by the same sinking of the treadle. By this simple apparatus, the great range is likewise given to the bead lam shaft of the catgut, which will be explained further on. It may likewise be observed, that the gauze warp is twisted the contrary way by this method, from what it is by the common mounting, which is necessary to be taken notice of in applying it to some species of fancy weaving.

The plain shed of this mounting is produced by sinking the back leaf *m* and raising *n*, the bead lams being slack; and this shed is reversed by the cross one.

This method of weaving gauze, especially when the standard is omitted, can only be applied when the weaving motions are very slow, as in several varieties of nets, or other extensive mountings: for it must be obvious, that unless the lams are allowed sufficient time to pass from the open or slack, to the tight state, before the succeeding sheds be opened, they will constantly be getting entangled among themselves, and either break the warp, or otherwise obstruct the weaver's progress.

WEAVING GAUZE WITHOUT THE UPPER DOUP AND STANDARD.

The most approved construction of the gauze mounting, however, where several sets are requisite, is by omitting the upper doup and standard, and making use of eyed heddles for the back leaves. Fig. 9 is a plan of this mounting, in which *m* and *n* are the two back leaves, 1 the under doup, and A its standard. The threads *i* and *o* are drawn through the eyes of the heddles on the back leaves as in the preceding mounting. The thread *i* has neither doup nor standard; but *o* is drawn through the under doup 1, in the very same manner as in the full mounting.

To produce the gauze twist by this mounting, the cross treadle *c* sinks the two leaves *m* and *n*, by which the whole of the warp is taken down to the race rod, and the shed is opened by raising the standard A with the doups tight. The open treadle *o* sinks *m* and raises *n*, while the doups are slack, and yield to the shed formed by the back leaves, as in the common way. The plain treadle *p* raises the leaf *m*, sinks *n*, and sinks the doup and standard.

As the warp threads, however, which are marked *o*, have more stress to bear while the cross shed is forming, than the others, they are beamed, as in the foregoing case, on a separate roll, which is allowed to yield freely to the tread. This roll is usually placed before the other.

REVERSING THE GAUZE TWIST.

In compliance with the general practice of entering a gauze web into the common mounting, the first thread which is drawn on the back leaf is crossed to the left above the other thread of the same splitful; but the same mounting, with the very same cording, will produce a gauze equally good, although this order of drawing in the warp should be reversed. Thus, the first thread *i*, Fig. 4, may be drawn through the upper part of a heddle on the leaf B, and again through the under doup 2; and the other thread *o* may be taken through the under part of a heddle on the leaf A, and crossing above *i* to the right, pass again through the upper doup 1: and this draught and cording will produce a gauze differing in nothing from that in Fig. 4, but that the twists on the warp are thrown the contrary way. Fig. 10 is an example of this method of weaving gauze, in which one splitful is drawn in the common way, and the other reversed, alternately. This variety in gauze weaving is sometimes introduced with good effect, especially if the two threads in each split be of different colours.

LINO, OR LINAU.

This species of gauze is woven merely by treading the plain and open treadles, of the common gauze mounting, alternately with the cross one: that is to say, the cross treadle is pressed down for every second shot, and the other two alternately. A specimen of the lino is given in Fig. 4, and the order of treading is marked by the letters *o*, *c* and *p*, opposite to the shots of weft which are respectively thrown into the open, cross, and plain sheds.

PIQUETS.

The variety of gauze generally known by the name of piquets, are simply plain gauze, omitting every third or fourth splitful of warp. They are woven in fine reeds, leaving the third, fourth, &c. interval empty; by which, two, three, or more splitfuls of warp run together in a stripe. Piquets are frequently ornamented like the gauze with spotting, spidering, lappeting, &c.

Piquets, however, are at present woven on silk in the form of turkey gauze, of which an example will be given under that article.

RIDDLES.

The warp of these run in stripes in every respect like the piquet, and they are checked by throwing in one or more sheds of plain occasionally, as in the lino. These grounds are also frequently ornamented with spotting, lappeting, &c. and are generally used for the bosoms of handkerchiefs, &c.

VEINING.

This is the production of a single gauze mounting, which is frequently added to that of gauze or plain ground, as a species of ornament. It is often applied as guards in plain cloth, where there are a few intervals of the reed empty, which are to be afterwards ornamented with the needle for trimmings, &c. The warp of a vein is only crossed at every fourth, sixth, &c. shot; the intermediate shots, which are alternate in the ground, being all thrown into one shed, forming, to appearance, only one coarse shot. Veins are also woven in small stripes along with lappets, victories, &c. which undergo no additional process. See an example of veining, along with gauze and plain texture in Fig. 11, Plate 6

CATGUT

Is another light fabric, resembling gauze, and is woven nearly in the same manner as that by the bead lams. The only difference between gauze and catgut is, that the warp of the latter receives half a twist more between the shots of weft than that of the former.

There are two ways of producing the catgut twist: one by two back leaves of eyed heddles, and a bead lam shaft and standard; the other by two back leaves and the bead lams, omitting the standard.

Fig. 11, Plate 5, is a plan of this mounting, with the bead lam and standard, exhibiting both the open and cross sheds.

The open shed of this mounting is formed by raising the leaf A and sinking B, while the standard C is raised and the lams slack; which, passing round the threads *o*, are raised by the threads *i* to the upper part of the shed, as represented in Fig. 12. This shot is pointed out in the specimen of cloth annexed to the plan, by the weft shot *o*. The cross treadle *c* raises both of the back leaves, and consequently, the whole of the warp; and the shed is opened by sinking this standard with the lams tight. While this shed is forming, the bead lams *x*, with their threads *i*, repass below the threads *o*, and, after again crossing above them, sink to the bottom of the shed on the right side, close to their standards, or in the tight state. The weft shot *c* distinguishes this shed in the specimen of cloth. Thus, by working these two treadles alternately, the warp threads are twisted and untwisted half a turn more than the common gauze warp, as will plainly appear by examining the Figs. The plain treadle *p* reverses the cross shed, sinking all the warp by the back leaves, and opening the shed by raising the standard with the bead lams tight.

The bead lam shaft and standard are mounted in the very same manner as represented in Fig. 8; and the necessary range is given to the bead lam shaft by shifting the connecting cord *y* to the right or left, until it be accurately ascertained.

Fig. 13 is a plan of the catgut mounting without the standard, consisting only of two back leaves and a single shaft of bead lams. The warp is taken through the back heddles, which are also eyed, in the same manner as the former; but as the standard is here omitted, the bead lams have to take half a turn more round the threads *i*, than in the preceding mounting. This will appear by inspecting Fig. 14.

To produce the open shed by this mounting, the leaf A is raised and B sunk; at the same time, the bead lam shaft 1 is sunk, to slacken the lams. In this shed, therefore, it will appear by Fig. 13 and 14, that the bead *x*, with its thread *o*, passes both under and over the other thread *i* of the same split, and then sinks to the bottom of the shed, at the left side of it. In the cross shed, both back leaves are sunk, which consequently, take all the warp down to the race rod; and the shed is opened by raising the bead lam shaft, by which the thread *o* is twisted round *i* in the contrary direction, and raises at last above the shuttle to the left .of it, as in Fig. 14. The weft shots at *o* and *c*, Fig. 13, will show these crossings and recrossings of the warp. Plain cloth is woven by the two back leaves, the lams being always slack. The treadles *p* and *o* are therefore wrought alternately for this purpose. It is farther to be observed, that all these bead lam shafts and standards are mounted with doup weights, as explained in the plain gauze.

Although the catgut was one of the principal textures in the silk manufacture, it has never yet been introduced with much advantage, in the manufacture of cotton. The original design of the gauze twist, seems to have been, to keep the weft shots of light fabrics at a due and regular distance from each other, so as to render the grounds sufficiently transparent, without the danger of making them thicker in one part than another, or to prevent the weft from running or crowding on the warp, as the lighter kinds of book-muslins are apt to do: and what is equally probable, to keep those spaces square, or nearly so, which are formed by the intersections of the shots of weft with the splitfuls of warp. But the silk warps, of which gauze was mostly made in Scotland, being too fine and smooth to offer the necessary resistance to the weft or shoot, to produce this effect, it may be naturally supposed, that the additional part of twist given by the catgut mounting has been applied merely to preserve this transparency, and proportional distances between the warps and wefts.

Cotton and linen warps, however, oppose greater resistance to the weft than silk; and therefore, by sleying them lighter or thronger, these fabrics may be easily made to suit any market. The catgut twist, however, may still be more advantageously applied in some kinds of cotton goods than the gauze. It has been already employed for veining, as the additional twist is better adapted to compress those shots of weft together which are thrown into the same shed, and give them the appearance of a single shot or cord. It might also be extended to purles, victories, and some other varieties, which only require the warp to be crossed at certain intervals.

SECT. II. FANCY GAUZE.

In the preceding section, the different methods of producing varieties of gauze, by one set of mounting, have been minutely explained: it remains in this to show how a diversity of pattern may be woven by increasing the number of mountings, as in the other branches of weaving.

The patterns which are to be treated of under this head are formed by combining either plain texture, or flushing, with gauze, as a ground. By the former of these methods, are woven those varieties which are known by the several names of purles, victories, crapes, and Turkey gauze; by the latter, chambries, gauze tweels, and Trafalgars.

GAUZE AND PLAIN TEXTURE.

There are two methods of producing patterns on this principle: the one, by a single set of back leaves and two or more sets of doups and standards; the other, by one set of front mounting, and additional sets of back leaves. The former of these methods is usually employed when two sets only are necessary; the latter, when the mounting is more extensive.

PURLES.

Fig. 1, Plate 6, is the plan of a mounting with two sets of doups and standards. It consists of the two back leaves A, B, and the two front sets C, D, which are the same as for the plain gauze. The warp is drawn into the back leaves in the usual way, and two splitfuls are drawn alternately on the two front sets. The treadle 1 forms the open shed of both mountings; treadle 2 produces the plain shed by the set of doups and standards C, and the cross one by the other set D. Treadle 3 reverses this cording; the set C forming the cross shed, and the set D the plain one. The cross sheds of both sets are formed by treadle 4, and both plain ones by treadle 5. All these sheds are pointed out by the numbers of the treadles at the ends of the shots in the specimen. It will be observed, that, in weaving plain gauze, by doups and standards, the upper doup thread sinks to the race rod in both sheds, and rises only in the plain one. That is to say, it sinks in the cross shed to the left of the under doup thread, and in the open one, to the right of it: consequently, plain texture can be woven by either of these sheds formed alternately with the cross one. When, therefore, this species of patterns are woven by additional front sets, the open shed, which is produced by the two back leaves, extends to all the warp, and, of course, is formed both in the gauze and plain parts: and as the upper doup threads lie on the right of the others in the plain parts, the twist is given by the cross treadle.

When the patterns, however, are woven by additional back sets, the cross shed is common to both in the gauze and plain parts: and as the upper doup threads are now on the left of the others in the plains, the warp is crossed or twisted into gauze by the open shed, and reversed by the cross one.

Fig. 2 is the plan of a mounting for the same pattern as the former, woven with two sets of back leaves. The leaves of one of these sets are marked 1 and 2, and of the other, 3 and 4; the front mounting being the very same as in common gauze. One half of the warp is drawn on the back set 1 and 2, and the other, on the set 3 and 4, two splitfuls on each alternately. But it must always be observed in mountings of this kind, that whatever back set any splitful of warp is drawn on, the first thread is always on the back leaf, and the other on the fore leaf of that set. The heddles of these back leaves are made with eyes, as they both raise and sink the warp occasionally. The warp is taken through the front mounting in the same manner as that of a plain gauze. The treadles 1, 2, and 3, weave the checker at *a*, 1 and 5 the plain cloth at *b*, and 1 and 4 the gauze at *c*. Hence it will appear, that the treadle 1 opens the cross shed over all the warp, this treadle having no connexion with any of the back leaves; and, consequently, it produces one of the sheds in each variety in the specimen, and is pressed down for each alternate shot. The treadle 2 slackens or relieves all the doups from their standards; but that part only of the warp which is drawn on the leaves 1 and 2 is crossed, or rather, returns from the cross to the open state, so as to produce the twist; the other half being converted into the plain shed by the contrary motion of the leaves 3 and 4. The treadle 3 operates on the front mounting in the very same manner as the treadle 2, but exactly reverses the motion of the back leaves, which, consequently, changes the gauze stripe into plain, and the plain into gauze. When the whole web is woven plain, the upper doup and standard are raised, and the under ones sunk, as in weaving lino; and this is effected by the treadle 5, which is also wrought alternately with the treadle 1, as will appear in the specimen. The treadles 4 and 1, as observed above, convert the whole of the warp into gauze, which is represented at *c*. It is therefore evident, that the weaver, when working with both feet, must keep his left foot on the treadle 1 in all these varieties, which he works alternately with any of the other treadles he may have occasion to employ.

VICTORIES.

By thus combining gauze and plain cloth, in different ways, arise that species of fancy gauze, called victories, which were manufactured some time ago in great quantities and variety. Their most predominant appearance is a number of small gauze spaces, interspersed with plains; sometimes checked by the weft, at others, thrown into small alternate checkers, though not always square. Some of these patterns were woven by one set of gauze mounting and a plain stripe, the gauze parts resembling lino; others, by two sets of gauze mounting, making these small gauze spaces alternate, the plains consisting of three or five shots, succeeded by the key shot, or by a few shots of gauze. These spaces or stripes of gauze were sometimes separated by a cord of coarse yarn, or more frequently by two splitfuls of warp drawn into two adjacent intervals of the reed, while the other intervals were alternately full and empty. These varieties were frequently increased by the addition of another gauze mounting for veining; whence these patterns were called veined victories.

CRAPES.

When three, four, or more sets of gauze mounting are thus employed to form figures of plain on a gauze ground, such patterns have assumed the name of crapes, although the crapes which are manufactured for mournings are of the plain texture, and the crisped appearance is given them in the process of dressing, after they are out of the loom.

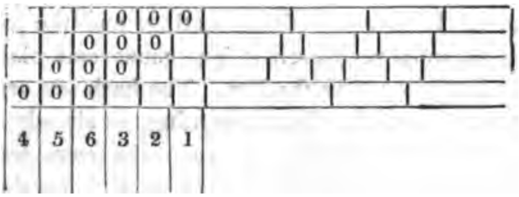
Fig. 3 is the plan of a crape, woven with four sets of gauze mounting, although, as formerly observed, only four back sets are necessary. The draught is in regular succession over the back sets of the mounting, and the pattern is that of a diagonal or biassed stripe, gauze and plain alternately, as represented in the Fig. The back sets are marked 1, 2, 3, 4, and the front mounting, as already noticed, is the same as that of a plain gauze. The cross treadle 1, works alternately with the treadles 2, 3, 4, 5, for the crape, with treadle 6 for plain gauze, and with treadle 7 for plain cloth. This will be plain by examining the cording on the back leaves; for, wherever a dot is marked on the fore leaf of any set, and a cross ×, on the back leaf, that set works gauze by that treadle on which they are placed; and where the cross is on the fore leaf, and the dot on the back one, plain cloth is produced.

As in diaper weaving, the utility of the binding plan was shown, in representing all the varieties of the draught and cording on a small scale; so in this, and several other branches of weaving, this contracted plan will be found equally advantageous: for if we suppose one leaf substituted for each set of the present mounting, and the gauze parts represented by raising marks, the draught and cording will be found the very same as the four leafed tweel, No. 1, page 5.

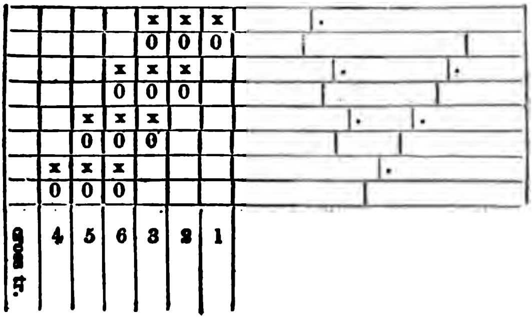
Hence it is evident, that every variety of pattern which has been exhibited in tweeling, lined work, or diaper, may be produced on crape, by taking such draught and cording for the binding plan, and substituting the gauze sets accordingly.

For Example.—Suppose it were required to weave the pattern, Fig. 30, plate 2, on crape. Here the binding plan will be the same as the draught and cording No. 57, page 41, which is here inserted, that it may be the more readily compared with the crape draught.

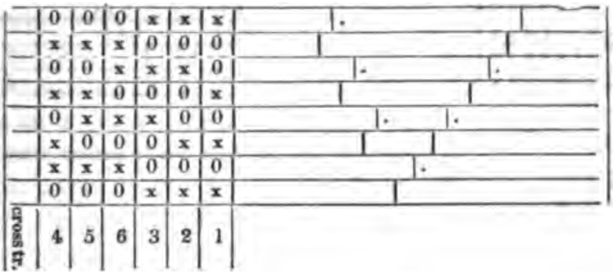
BINDING PLAN.



CRAPE PLAN.



In this example the gauze parts only are corded, which is effected by placing the sinking mark on the back leaf of each set, and the raising mark on the fore one. The plain cording is added by filling up the vacant spaces with the marks reversed; that is, the crosses on the fore leaf of each set, and the dots on the back ones, as in the following plan:—

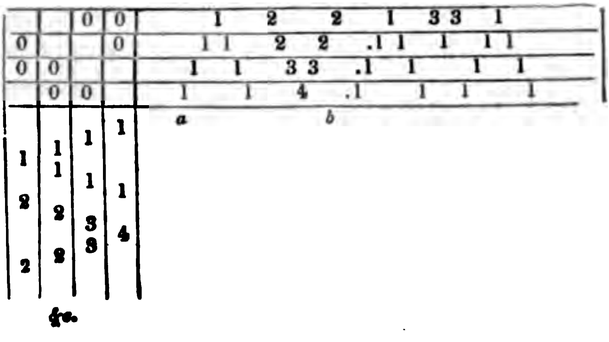


	0	0	0	x	x	x
	x	x	x	0	0	0
	0	0	x	x	x	0
	x	x	0	0	0	x
	0	x	x	x	0	0
	x	0	0	0	x	x
	x	x	x	0	0	0
	0	0	0	x	x	x
cross tr.	4	5	6	3	2	1

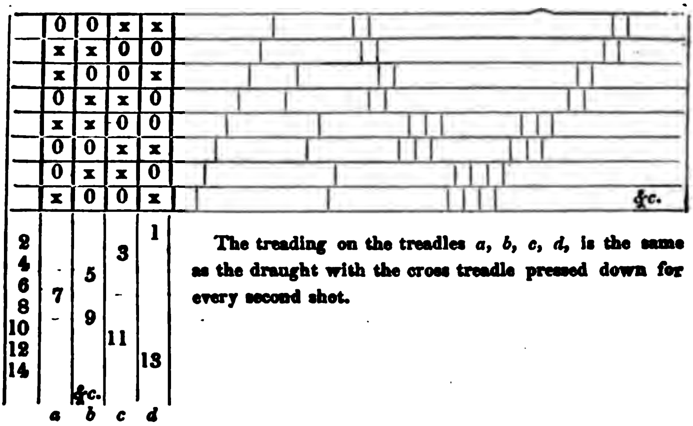
The cross treadle has no marks on the back leaves.

The following example will show how diaper patterns may be woven on crape. It is the draught and cording of Fig. 9. Plate 4.

BINDING PLAN.



CRAPE PLAN.

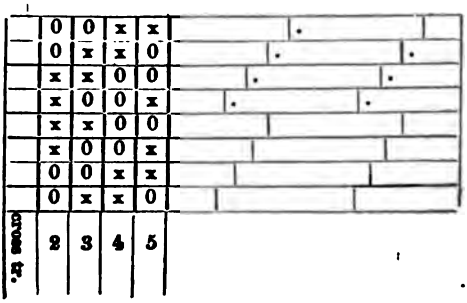


0	0	x	x
x	x	0	0
x	0	0	x
0	x	x	0
x	x	0	0
0	0	x	x
0	x	x	0
x	0	0	x

The treading on the treadles *a*, *b*, *c*, *d*, is the same as the draught with the cross treadle pressed down for every second shot.

The draught here, to save room, is only that part of the binding plan, from *a* to *b*.

In these examples, the two leaves of each set are placed together, that the method of cording may be more distinctly pointed out. But it is considered preferable by some to have all the back leaves placed together behind, and all the fore ones in their front. The draught and cording of Fig. 3, Plate 6, with the leaves arranged in this manner, will stand as below.



0	0	x	x
0	x	x	0
x	x	0	0
x	0	0	x
x	x	0	0
x	0	0	x
0	0	x	x
0	x	x	0

Here it will be observed, that the raising marks on the fore leaves form the exact cording of the common four-leafed tweel, while the sinking cords take the very same form on the back leaves.

TURKEY GAUZE.

This variety of fancy gauze is woven on the same principle, nearly, as crape. In the Turkey gauze, however, there are sometimes three, four, five, and even six threads in one interval of the reed, which are all twisted together in the gauze parts; but when they are spread out in the plain parts, they form a more solid and substantial fabric than can be produced on crape.

Turkey gauze has a very beautiful appearance when woven on silk: for the natural elasticity of this substance allows it to expand, and fill the interstices of the plain parts, while it is easily compressed into a fine transparent fabric by the gauze twist. Cotton yarn, however, does not possess this property in such a high degree as silk; and therefore, the attempts which have been made to introduce it into the cotton manufacture, has not been attended with that success which was to be desired.

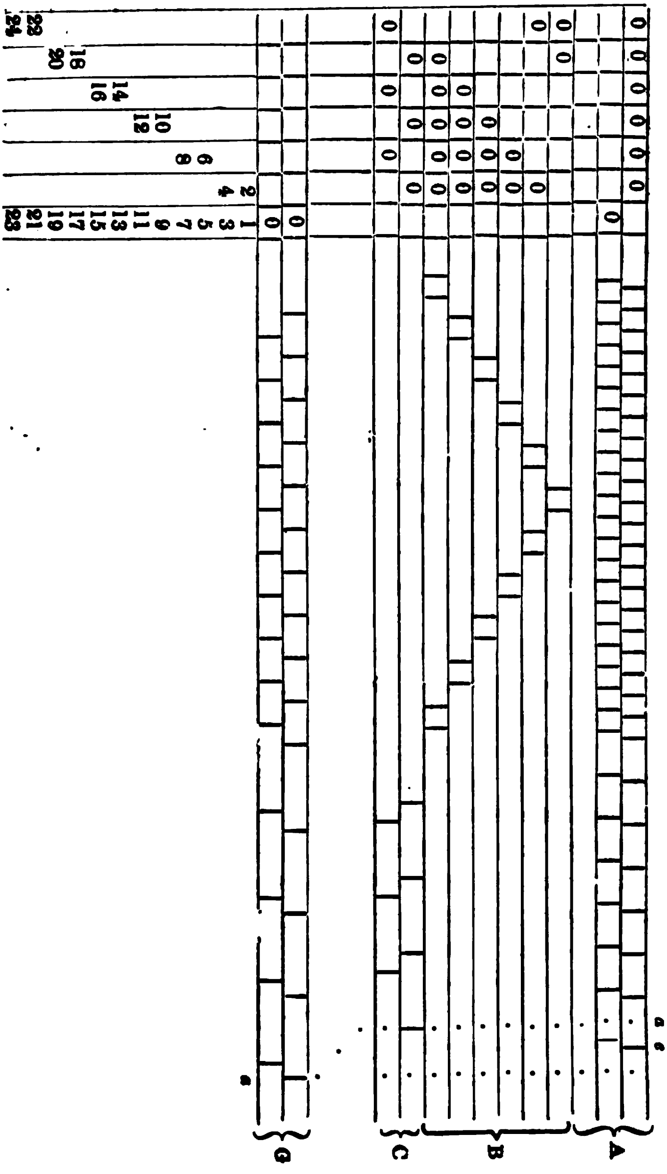
Fig. 4, Plate 6, is the plan of a Turkey gauze mounting for two sets, and three threads in the split. The back leaves of one set are numbered 1, 2, 3, and those of the other set, 4, 5, 6. The two front mountings are on the principle explained in section 1st, for omitting one of the doups and standards. The shafts marked *o i*, are the under doup and standard for one set, the upper or back doup and standard being omitted; *a* and *e* are the upper doup and standard for the other set, the under ones being here omitted. When, therefore, the cross shed of the set *o i* is formed, the cross thread is sunk by the back leaf, and raised by the doup and standard on the right of the other two threads. But when the open shed of this set is produced, the doup is slack, and the cross thread is raised by the back leaf on the left of the other two. The cross shed of the set *a e* is opened by raising the cross thread by the back leaf, and sinking the standard with the doup in the tight state on the left of the other two; and the open shed is formed by sinking the cross thread by the back leaf, while the doup is slack; and consequently, the thread sinks on the right of the other two. The cross shed, therefore, of both sets are formed by the treadle marked 1, and the open one by 2. The treadle 3, wrought alternately with 1, produces plain texture; and the treadles 4 and 5 are corded so as to make plain with one set, and twist with the other alternately, when wrought along with treadle 1.

It was formerly observed, that when gauze is woven by omitting the upper doup and standard, the warp of the under doup was beamed on a separate roll from the other, that it might be slackened a little while the cross shed was forming. The same observation must be applied to the warp of the upper doup in this mounting, as these two threads act independently of each other, and have more stress to bear than the other two threads of the same splitful.

Fig. 5 is the plan of a mounting for weaving a two set Turkey gauze with four threads in the split. This mounting, however, has only one front set; for the alternate changes from the twist to the plain are effected by the back leaves. When the two centre treadles are employed, the splitful marked *e* is twisted: for the treadle 1 raises the cross thread by the doup and standard, in the tight state, on the right of the other three, while they are all sunk; and the treadle 2 raises the same thread by the back leaf, on the left of the other three, the doup being slack. The remaining cords are so placed, that the splitful *a* makes plain cloth.

Again, when the two outward treadles are wrought, the splitful *a* is twisted; the cross thread being raised and sunk in the very same manner as in the other, while the splitful *e* is woven plain. This will obviously appear by comparing the raising and sinking marks on the treadles, with the draught. It is to be observed, however, that here the cross thread is warped round the other three, as if they were only one cord; but in Fig. 4, the two threads which have no doup, are raised and sunk alternately, whether the texture be gauze or plain. The same effect may be produced by the mounting Fig. 5, by changing the raising and sinking marks on the back leaves.

Fig. 6 is the plan of the same kind with five threads in the split. As the principle, however, is the very same as that of Fig. 5, any further description will be unnecessary.



TURKEY GAUZE AND PIQUET.

In this plan, A is a set of ground or plain leaves, on which there are two threads for each split; B are the figure leaves, which are corded for a diamond spot; C are the piquet leaves, corded to make a barley-corn spot; and G *a*, fore doup and standard, the same as in common gauze, but divided into two, or clifted, to avoid friction. The raising cords produce gauze, and the sinking ones, or blanks, the figure. The threads on the leaves B and C, are called whip; one thread of which twists round two of the ground, making three threads to the split. That is, the thread *a* on the leaf at C, rises at one shot in its present position, and at the next in the position at *a*, on the leaves G, when working gauze; but in weaving plain texture to form the figure, it raises and sinks alternately, in the position at C.

There is another variety of this kind of gauze, with four threads in the split, in which the threads are twisted by pairs in the gauze parts, while they are woven separately in the plains. The specimens which I have seen of this fabric, which is said to be of Russian manufacture, were made of linen yarn, and employed for wine rubbers.

This texture appears to be woven by taking two threads through each doup, while they are drawn on separate back leaves. By this means, the plain parts will be woven entirely by raising and sinking the back leaves, the doups being kept in the slack state; and the twists will be produced by the open and cross sheds, as in the common gauze.

GAUZE AND FLUSHING, OR TWEELED GAUZE.

In this species of fancy gauze, the figures are formed by throwing a certain number of weft shots into the open shed successively, without working them into cloth, as in the crapes. When those figures, therefore, are thrown into diagonal or biassed stripes, they bear a pretty strong resemblance to tweeling, whence, it would appear, the name is derived. It is evident, however, that as the flushing thus produced cannot be carried to a great extent without deteriorating the fabric of the cloth, patterns of this kind must be very limited, both with respect to their number and magnitude.

One set of mounting, on this principle, produces the common veining formerly explained. With two sets are woven what are by some called chambries; and the biassed or diagonal patterns formed by four sets have obtained the name of tweeled gauze There are patterns woven likewise in the diamond draught, forming bird-eye figures, with a barley-corn spot in the centre of each diamond, which have been named Trafalgars, in compliment to that great victory: and these appear to be the chief varieties which have been woven on this principle,

It was formerly observed, that, in weaving plain gauze, the upper doup thread sinks to the race rod on the right and left of that in the under doup, alternately, so that plain cloth can be produced by reversing either of these sheds; and, therefore, that crapes may be woven either by one back set and a given number of front ones, or by one front set and the requisite number of back ones. As the tweeled gauze, however, must continue either the open or cross shed for three successive shots, while the other is opened at certain intervals only, to form the gauze twists; and as it is impossible that one set, either of back or front mounting can produce both of these sheds at the same time, it is evident that back and front leaves must be employed for each set. In order, however, to reduce the mounting as much as possible, it is usual to omit the upper doup and standard, as has been explained in the preceding section, and illustrated by Fig. 9, Plate 5; and as the open shed, in this method, extends over all the warp, while the cross sheds are opened, when necessary, by raising the fore standard with the doup tight, one leaf only will be requisite for all the warp which, in a full mounting, would be drawn through the upper doup, and thereby the number of back leaves is considerably reduced.

Fig. 7, Plate 6, is a two set mounting of this kind, in which the warp is drawn, two splitfuls on each set, alternately. On the leaf 1 is drawn that half of the warp which wants the upper doup and standard, or that which sinks in forming the open shed; and the other half, which is raised by the front mountings in producing the twists, is drawn on the leaves 2 and 3, and passes afterwards through the doups of the standards 4 and 5, respectively. The treadle marked 1 forms the open shed of both mountings; that is, it sinks the leaf 1 with one half of the warp, while the other half is raised by the leaves 2 and 3; the two sets of doups being relieved by sinking their standards in the common way, and yield to the warp which is raised by the back leaves. The treadle 2 forms the open shed by the standard 4 and corresponding back leaf 2, while the standard 5 and its doup are raised, and produce the twist on their portion of the warp. Treadle 3 is exactly the reverse of treadle 2; it produces the open shed by the standard 5, and the cross one by the standard 4. Treadle 4 wrought alternately with treadle 1 produces gauze, and the treadles 5 and 1 make plain cloth, as will appear by inspecting the specimens of cloth attached to the Fig. where the figures at the ends of the weft shots refer to the numbers on the treadles which open their respective sheds.

Fig. 8 is a plan of the mounting of a tweeled gauze, or four sets, with specimens of the cloth which it produces. The back leaf 1, as in the preceding mounting, contains one half of the warp, and the other half, which is drawn into the doups, is distributed among the leaves 2, 3, 4, 5, in the same order as the draught of an over and over four-leafed tweel.

The open shed of this mounting is formed by sinking the treadle 1, which takes down the leaf 1, and raises the leaves 2, 3, 4, and 5, while all the four standards are sunk and the doups slackened, so that the under doup threads are raised to the left of the others. Treadle 6 forms the cross shed over all the warp, in which the under doup threads are raised on the right of the others; consequently, this and treadle 1 produce plain gauze. Treadle 7 reverses the shed of treadle 6; these two treadles, therefore, work plain cloth. The treadle 2 sinks the back leaf 1, and raises 2, 3, 4, for the open sheds of these sets; but the leaf 5 and standard 9 must form the cross shed of this set, and therefore the leaf 5 is sunk, and the doup with its standard raised, by which the twist is effected. The remaining treadles 3, 4, and 5, are sunk in succession, and produce the gauze twist on the other three sets, respectively, as marked at the side of the specimen.

It may be observed in this species of weaving, that, as the weft shots next the key shot are thrown into a serpentine form by the crossing of the warp, especially when the warp is drawn on two sets in alternate splitfuls, if coarse weft, or weft of another colour be thrown into these sheds, it will give a variety to the fabric which has often a very pleasing effect.

From these two examples it will be easy to make a draught and cording for a bird-eye or diamond draught; and as the Trafalgar comes under the character of spotting, it will be exemplified in the next chapter, which treats on that subject.

SECT. III. OF NETS.

When the preceding varieties of cross weaving are well understood, the transition to nets will be short and easy. In the varieties of gauze, the two threads of warp which are twisted together, are confined entirely to the same interval of the reed in which they are crossed to the right and left alternately between the shots of weft. In nets, however, either a part or the whole of the warp is crossed before the reed; and the threads of different intervals are occasionally linked together by the weft. That part of the warp which thus crosses or traverses before the reed, and forms the principal variety in the texture, is called whip: and as it has more stress to bear than almost any other kind of warp, it is generally made twofold, or of two ends of yarn twined together.

The whip parts of a net mounting which correspond to the doups and standards of a gauze, are placed before the lay, between the race rod and the reed, by which means the crossings of the whip are effected in front of the reed and standards.

In net mountings, the half leaves or doups are called bead lams, from their having small glass beads in their loops or bows, through which the threads of whip are drawn. These beads are indispensably necessary, to avoid the great friction which would otherwise be occasioned by the motion of the heddles backward and forward with the lay at each shot, as well as by the crossing of the whip, or, as it is called, *tumbling* of the beads in front of the standards, in the cross shed. The back leaves of nets are also, in general, made with beads instead of the eyes or clasps of other heddles. This species of weaving originated in the silk manufacture, though it has been successfully applied to cotton.

THE FALSE SPIDER NET.

This net, however, which is now to be explained, is an exception to the general character of nets, as the whip part of the warp does not extend beyond its own interval of the reed; and no part of the mounting, in the present method of weaving, is attached to the lay; although it was formerly woven with two bead lams, after the manner of lappets.

Spidering, as it is frequently termed, is woven by raising a thread of whip, alternately, on each side of a splitful of gauze or plain warp, every second interval of the reed, in general, being empty; which gives it a zigzag, or serpentine appearance on the cloth. The motion of the whip threads of adjacent splits are usually reversed, one rising on the right, and another on the left of its respective splitful; and the two threads thus meeting and receding alternately, form the whip into small square or diamond figures on the ground.

The mounting commonly employed for this net, consists of the fore part of the original gauze mounting, called through-puts, which has been already explained, combined with that of the ground, whether gauze or plain cloth. Sometimes the whip is raised by an under doup and standard and a back leaf, as has been explained under that method of weaving gauze.

In the first method, the two standards C and D, Fig. 6, Plate 5, are placed, one on each side of the splitful of warp, and the doups 1 and 2, which are connected together by an eye or bead, through which the thread of whip is drawn, are below the warp. When the standard C is raised by the cross treadle, the doup 2 is relieved, as in the open shed of common gauze, by which the thread of whip *a a*, is raised on that side toward C, where it is fastened by the shot of weft. At this tread, all the ground is sunk, and the whip only is raised above the shuttle, to form the upper part of the shed. The next treadle sinks all the whip, and opens a shed of the ground, into which the second shot of weft is thrown. For the third shot, the standard D is raised, and the doup 1 is slackened, by which the whip thread *a a*, is again raised on the opposite side of the splitful of warp, towards D, where it is also interwoven with the weft; the ground being sunk as before. Thus, in the net parts, one shot of weft is interwoven with the ground, and another passes through a shed formed by sinking the ground and raising the whip, by which it is interwoven with the cloth.

Fig. 9, Plate 6, is the draught and cording of the false spider net, woven in stripes on a gauze ground, along with another stripe of plain gauze. The two leaves 3 and 4 are for the plain gauze, 5 and 6 for the gauze under the spidering; 1 and 2 are the standards for the under doups, the upper ones being omitted; and C, D, the standards for the whip, corresponding with those in Fig. 6, Plate 5. *a a*, are the threads of whip. The treadle G raises the standard C, which draws the threads of whip *a a*, from their parallel position at *i*, to the position *o*, as represented by the dotted lines, where they are raised above the shuttle. At the same time this treadle sinks the ground of the spidering, but opens the cross shed of the plain gauze. The treadle *c* sinks the whip, forms the cross shed of the ground, and the open shed of the plain gauze. Treadle H sinks the ground, opens the cross shed of the plain gauze, and raises the whip in the position *i*. Treadle *o* sinks the whip, and forms the open shed of both the gauze mountings: all of which will be easily understood by inspecting the two Figs.

The false spider net is thus woven in stripes of various breadths; but when it is formed into checkers or alternate squares, which seems to be the greatest extent in point of variety to which it has been carried, two sets of the through-puts are requisite, and sometimes two of the ground; and these sets are wrought so as to make their respective figures bosom each other; the parts of the whip which are omitted being afterwards cut away.

If we now consider the thread of whip merely as a half twist of gauze warp, and the splitful of warp round which it twines, the other half; it will easily appear that this net may be woven, like the gauze, by an under doup and standard, as has been already noticed. By this method, the back leaf which raises the thread of whip must have its heddle on the left side of the splitful of warp, and the doup and standard on the right with the thread crossing below, for one side of the diamond, and the position of the doup reversed for the other, the open shed will therefore raise the whip on the left, and the cross one on the right of the splitful of warp in the former, and the reverse in the latter, which produces the very same effect as the method above described. It is to be observed, however, that in this method, as well as in the preceding, the ground is always sunk when the whip is raised, and the ground shot is thrown in when the whip is sunk.

This net may likewise be imitated by the lappet needles, either with a single or double frame, as is done in some of the finer kinds of nets, which will be described farther on.

WHIP NET.

This net takes its name from the warp being wholly of whip, without any other ground. The mounting of the whip net, like that of the common gauze, consists of two back leaves, two standards, and two bead lams or half leaves. The two back leaves are placed behind the reed in the usual way; and the bead lams with their standards are placed in front of the lay, between the race rod and the reed, as formerly mentioned. But as beads are frequently used instead of eyes in the back leaves also, and these mountings are generally constructed to weave dropped, as well as plain nets, the back heddles are usually divided into four leaves, by which the friction is avoided that would be occasioned by the beads being too much crowded together.

Fig. 2, Plate 7, is a plan of the whip net mounting, with a specimen of the cloth annexed, both when it is woven plain and when it is dropped. A and B are the two back leaves, each of which being divided into the other two parts marked 1 and 2. C and D are the standards, and 1 and 2 the half leaves or bead lams, corresponding with the doups and standards of the full gauze mounting. The reed, which shows also the position of the lay, is here seen between the back and front mountings. Let the dots on the leaves C and D represent sections of the twine of which the heddles are made, and they will point out the position of the standards. The upper bead lams, with their beads, through which the whip threads are drawn, will then appear as passing through the heddles or standards on the leaf C, the beads being in front at *v;* and the under bead lams will be seen as if rising through their standards on the leaf D, crossing below the others towards the front at *x*. The marks on the treadles will point out the raising and sinking cords, as in the plain gauze.

But the manner in which the bead lams cross in front of the standards will appear to more advantage in Fig. 1 of the same Plate. Here the upper bead lam shaft is marked 1, and its standard C; the under bead lam 2, and its standard D, as in Fig. 2. When the open shed is formed, the bead lams assume the position represented in the Fig. at *x* and *v;* that is, the bead lam *x* on the shaft 2, crosses in front of a standard on the shaft *c*, and rises on the left of the bead lam *v*, while the bead lam *v* on the shaft 1, crosses in front of a standard on the shaft D, and sinks on the right of *x:* the threads passing through these two beads being in the same interval of the reed; and this forms the open shed, which is pointed out by the weft shot 2, in Fig. 2. Again, in forming the cross shed, the bead *v* is drawn close to its standard at *u*, and the bead *x* is drawn back to its standard at *a*, while the standard D is raised, and C sunk, as in the cross shed of the common gauze. This shed is marked by the weft shot 1 in Fig. 2; and thus the crossings of the whip are effected.

Plain texture is produced, as in gauze, by working the two treadles 1 and 3. Sometimes this net is woven with a plain shot between each crossing of the whip, as represented at No. 2 in the specimen. This makes an excellent strong fabric for various purposes, particularly tambour or needle-work. The drawing of the warp into the heddles, mounting of the leaves, and applying the doup or bead lam weights, are, in every respect, the same as in the common gauze, and require no farther illustration.

It was formerly observed, that the back and front mountings of the gauze are placed at about three and a half to four inches separate, that the warp may have sufficient room to twist between them in opening the cross shed. In nets, however, the correspondent crossing of the whip takes place in front of the standards, where it is forced nearly into a vertical position. It is therefore necessary that the whip should be slackened more in the cross shed than any other kind of warp, so as to yield freely to the pressure of the cross treadle, otherwise it would be impossible to obtain a shed. The method usually employed for this purpose, both for this and the other nets, is as follows: *a o*, Fig. 3, is a couper suspended from the loft, from the end *a*, of which a cord descends to the end of a long march *n*, which is again connected to the cross treadle *t*. To the other end *o* of the couper is tied the cord *i*, which, after taking two turns round the end of the whip roll *x*, suspends the pace weight *w*. Sometimes a thong or strap of leather is used for that part which goes round the roll, and a little chalk rubbed on it to prevent it from slipping. Now it is plain, that when the cross treadle 1, Fig. 2, is pressed down, it sinks the long march *n*, and, consequently, the end *a* of the couper, by which the other end *o* will be raised, and turn the roll round on its axis by the cord *i*. By this means the whip is slackened, and a greater or lesser range is given to it, to suit any given pattern, merely by shifting the fulcrum or centre of motion farther from, or nearer to, the end *o* of the couper.

There is another circumstance which requires particular attention in nets that does not occur in gauze. In the gauze mounting the two threads of each split rise and sink between their respective standards; and, in the cross shed, the doups are drawn tight by the weights, so as to pass each other without any friction, especially if the web be properly mounted. In the whip net, however, see Fig. 1, the bead lams project beyond their opposite standards, and therefore, were the weights allowed to act upon them with their whole force, they would be drawn so tight or close to their standards as prevent the beads from *tumbling*, as it is termed, or the cross shed from opening freely. On the other hand, were the bead lams too slack, the friction occasioned by the tumbling of the beads would soon prove destructive to the standards, besides being liable to get frequently entangled among the warp. To prevent both of these inconveniencies, each bead lam shaft is connected, at each end, to the opposite shaft of its respective standard, by a piece of twine called a bridle, as represented at *m*, *n*, in Fig. 1. By means of these bridles, the weaver can temper the front mounting to his mind, as they are made with snitches the same as those on the treadle cords. Sometimes the under bead lam shaft is bridled to the end of the couper of the front standard, by which method, the bridles are kept clear of the shuttle. In general, the bead lams project through their standards, when the mounting is stationary, about a quarter of an inch; but every weaver tempers his bridles to such a degree of tension as may best suit the state of his mounting.

It may be further observed, of nets in general, that the weaving motions should be very slow, uniform, and steady. The sheds are opened by a gradual pressure of the foot on the treadles, without any sudden jerks, which would cut the whip, and, in a short time, destroy the mounting. At the same time the lay is put back with the same steady motion, while the shed is opening. The shuttle is driven through the sheds with equal caution, lest it should dip, or get entangled among the bead lams and standards. This, however, is in a great measure prevented by pins made of brass wire, driven into the lay immediately behind the race rod, along which the shuttle runs instead of the reed in other kinds of weaving. After the weft shot has been thrown into the shed, the treadle is relieved in the same gentle way, by which the weights have sufficient time to act upon the bead lams, and keep them in a uniform degree of tension, while the lay is brought forward by the same steady motion to the face of the cloth.

It is also of the greatest importance that all the cordage be properly tempered, which, with due attention, will easily be effected by means of the snitch knot, which must be well known to every tradesman.

As the crossing of the whip, in net weaving, necessarily produces a deal of friction, a greater power is requisite to be exerted on the cross treadle than in any other species of light fabrics. For this reason, the treadles are placed below the warp roll, and the weaver works on the ends towards him, by which he gains the whole of the lever power.

SPIDER AND MAIL NETS.

These two nets are woven in the same mounting, and have the same relation to each other as the gauze and lino.

The mounting is merely that of the common gauze, which is here called the ground, combined with that of the whip net, with which the ground is interwoven. The gauze part of the mounting, and the back leaves of the net, are placed behind the reed, and the two bead lams and their standards are before it, as in the preceding mounting. Either of the methods for reducing the number of leaves, formerly explained, may be adopted for the ground, though the full mounting is generally preferred: for, with the full mounting, only two warp rolls are necessary, one for the ground and the other for the whip, while either of the other methods require two for the ground, that one half of the warp may yield a little more than the other when the cross shed is forming.

The spider net is woven with two treadles, which produce the texture of plain gauze interwoven with the whip: the mail net requires only the addition of a plain treadle, on which every fourth shot is thrown in.

Fig. 4, Plate 7, is a plan of this mounting, with specimens of the varieties it produces, in which the different crossings of the ground and whip may be easily traced. The back leaves of the gauze are marked 1 and 2; the standards A and B, and their doups *a* and *e*. The back leaves of the net are marked 3, 4, and these are all behind the reed, as formerly noticed. In the front, between the race rod and the reed, are placed the whip standards C and D, with their respective bead lams *v* and *x*. The position of the whip standards, with respect to the threads of warp, is pointed out by dots on the shafts C and D, one on each side of its respective bead lam. These lams appear in the Fig. as if a little slackened by the open treadle, and crossing each other in front of the standards, exhibit the whip threads passing through the beads at *v* and *x*. The crossing of the bead lams, when the open shed is fully formed, will appear to more advantage in Fig. 1, the threads of gauze warp being in the position of the letters *v* and *x*.

By comparing this plan with those of the gauze and whip net considered separately, the processes of taking the warp through the beddles, and tying up the treadles, will be obvious, and can require no farther explanation; for each of the mountings are tied to the treadles in the same order as if they had been mounted separately.

It may be necessary to observe, however, that when the full gauze mounting is employed, as in the present example, or when the back doup and standard are omitted, each treadle will produce similar sheds in both mountings; that is to say, either both open or both cross; but when the gauze part is mounted with the bead lam and standard, it is necessary to cord the treadles so as to produce the open shed of the gauze along with the cross shed of the whip, otherwise the whip would not run in between the threads of gauze warp, to form the net distinctly, as represented in the specimen.

The apparatus for slackening the whip in the cross shed, as well as the bridles for preventing the bead lams being drawn too close to their standards, are also necessary in this mounting, and are applied in the very same manner as in the whip net.

PATENT NET, OR NIGHT THOUGHT.

This net, like the preceding, consists of a gauze ground interwoven with whip. Two sets of mounting are therefore requisite, one for the ground and the other for the whip or net part; but as this net involves greater variety than any of the foregoing, it requires four treadles to work one set of the pattern. Either the full mounting, or one of the contracted methods may be employed for the gauze part; and the whip requires two back leaves, and two bead lams and their standards. When the full gauze mounting is employed, three warp rolls are requisite, one for the ground and two for the whip. These last are necessary, as one half of the whip is occasionally crossed while the other half is straight and parallel; and, consequently, each half must be slackened independently of the other. When the gauze part is woven either with the bead lam shaft, or by omitting the upper doup and standard, two rolls are also necessary for the ground, as formerly described. Some add another roll for the selvages, which, being woven plain without any twist, do not work up equally with the other warp. This, however, is commonly avoided by beaming the selvages on the same roll with the ground, and suspending a small weight to each, below the roll, to keep them moderately tight; and the slack part is taken in at the face of the cloth, when necessary, at the end of a piece.

Fig. 6, Plate 7, is a plan of the night thought mounting, with a specimen of the cloth, as in the other examples. The shafts marked 1 and 2 are the back leaves for the gauze part, the back leaves for the whip being marked 3 and 4. 5, 6, 7, 8, are the doups and standards of the ground mounting, which, in this example, is full. The bead lams and their standards, which are before the reed, are marked *a*, *e*, *i*, *o*, and are placed exactly in the same position as in the other mountings for net weaving.

Fig. 5 is a front elevation of the bead lams and their standards, representing their position when the open sheds are formed. *a* is the shaft of the upper bead lams, and *o* that of the under ones. *e* and *i* are the back and fore standards, respectively. In the shed here exhibited, which is opened by the treadle marked 4, both the upper and under lams are slack, and, after crossing two splits of gauze and one of whip, the former are sunk and the latter raised by the whip, which is now acted upon entirely by the back leaves. That is, the upper lams cross from their standards at *u* to the interval *x*, where they are sunk; and the under ones, from *d* to *c*, where they are raised. This is likewise the open shed of the gauze mounting. In the shed formed by treadle 3, the upper lams are slack with the whip sunk, as in the preceding shed, but the under lams are drawn tight to their standards, by which they are raised with the whip crossed. This treadle makes the cross shed of the ground. The treadle 2 draws both the upper and under lams tight to their standards, by which the former are sunk and the latter raised; at the same time the ground forms the open shed. In the shed formed by treadle 1, the upper lams are tight, and sunk by their standards, while the under ones are slack, and raised by the whip, the ground forming the cross shed. All this will plainly appear by an attentive perusal of the two Figs. 5 and 6.

PRINCESS ROYAL NET.

This net is woven in a mounting the very same as that of the night thought, but with a small difference in the order of taking the whip through the heddles and of tying up the treadles. But as these are distinctly marked on the plan, Fig. 8, they can require no farther explanation. Fig. 7 shows the crossing of the bead lams, in the open shed, in the same manner as in the preceding net.

DROPPED NETS.

The whip and mail nets are frequently ornamented with a variety of figures, which are formed on the cloth, merely by preventing the crossings of certain portions of the whip, for one or more shots, which leaves open spaces in the ground, larger than the common meshes of the net. This may be effected, either by preventing part of the upper bead lam whip from sinking, or of the under bead lam whip from rising, in the open shed, by means of additional back leaves applied for that purpose; the arrangement of which, to obtain a variety of patterns, being the same as in spot weaving, will be explained in the next chapter.

Omissions of this kind sometimes take place by accident in the course of weaving, which, being then considered damages, are mended, by tying the two threads together which ought to have been crossed, with a thrum or other fine thread: but when these spaces are disposed in any regular order, so as to form figures on the ground, they produce a beautiful variety of fanciful ornament, which, in general, has very much the resemblance of lace.

An example of this kind of ornament will be seen on the whip net at *z*, Fig. 2, Plate 7. This specimen is an allover, produced by the two back leaves 1 and 2, of the back part of the mounting at A. Here it may be observed, that that half of the whip which is drawn on the two leaves at A, and which belongs to the upper bead lams, must be sunk in the sheds, to produce the crossing. But suppose, for instance, the treadle number 5, to be pressed down for the open shed; then, the leaf 1 at A, instead of sinking, is raised, and consequently prevents all the whip which is drawn on it from crossing with the corresponding threads of the under bead lams; and therefore, when the weft shot 5 is thrown across, the threads which were not sunk will run into the position represented at *z*. The cross treadle 1 is next tread, which opens the whole of the cross shed, into which the shot 1 is thrown. The next shed, which is produced by the treadle number 4, is similar to that formed by number 5, the other half of the whip of the part A being prevented from sinking by the leaf 2, and another row of spaces formed in the bosom of the former, at the weft shot 4.

The very same effect would have been produced had the two leaves 1 and 2 at the part B been alternately sunk, with the cross treadle 1 intervening; only, both of the threads *a* and *i*, at the sides of each space, would have been below the weft shot, or would appear as on the under side of the cloth in the present specimen. The same is to be understood of the dropped spider net; for the omissions are made by the back leaves of the whip part, in the very same manner as in the present example.

It is observable in the allover dropped whip net, that the two threads *i* and *a* form a twist resembling a splitful of gauze warp, thrown into a zig-zag or serpentine direction, which gives this pattern the appearance of one which was frequently woven on the silk, and known by the name of the balloon net; on which account it sometimes passes under that name.

These examples, it is presumed, will be sufficient to explain the nature and processes of net weaving, and to show that, by changing the order of the draught, cording and treading, considerable variety may be produced in these fabrics as well as in the other branches of fancy weaving. I might, indeed, have added examples of the night thought and princess royal woven without the ground or gauze part, but as these, and a great variety of other patterns are now woven without heddles, merely by needle frames, which are shifted so as to produce the requisite crossings of the whip, it would only be taking up time to little or no purpose.

SECT. IV. OF LAPPETS.

LAPPETS may, without much impropriety, be classed among the varieties of cross weaving, as the whip, which was formerly raised by bead lams, is crossed from right to left, alternately, in front of the reed while the pattern is forming.

In the original method of weaving lappets, which formerly formed a considerable branch of the silk manufacture of Paisley, the bead lam shafts were attached to the lay, behind; and a lam, or doup, from each shaft, passed through the reed at different intervals, and united in a small glass bead below the warp. The whip, which was sometimes taken through the reed, and sometimes below it, passed through these beads, so that, by raising any one of the bead lam shafts, the thread of whip was drawn by the bead towards that interval of the reed through which the lam passed, and there raised above the shuttle, where it was fastened to the face of the cloth by the weft. By this means the whip could be drawn across the warp and raised opposite to any interval of the reed through which a lam passed, and formed into various figures on the under surface of the cloth, according to the number of shafts employed, and the order in which they were raised. The whip, as in the present mode, was beamed on a separate roll from the main warp, and was slackened by every treadle that raised a bead lam shaft.

This is the method by which silk lappets were formerly woven in Paisley, and which was subsequently introduced into the cotton manufacture. But as every process of weaving, in which any part of the heddles is subjected to the oscillatory motion of the lay, must be both tedious and intricate, the more simple method of raising the whip by needles placed vertically in a frame, and which could be moved horizontally, at pleasure, by the weaver's hand, was invented soon after the cotton manufacture became extensive.

SINGLE FRAME LAPPETS.

The first kind of lappets which were woven on this principle were produced by one needle frame, from which the name is derived. A representation of the needle frame, adapted to these patterns, will be found at Fig. 1, Plate 8. It consists of the two parallel wooden shafts, *a a*, which are connected together by the upright pieces, *o o*. In these end pieces are grooves, in which the needle shaft *i* moves up and down. The upper side of this frame is placed in a groove, cut in the upper shell or handle of the lay, in such a manner as the needles may stand between the race rod and the reed; and the weaver keeps his left hand on the spring *u*, which is fastened to the frame, and moves the whole apparatus from right to left, alternately, while the pattern is weaving. At *x* is placed the rack *e*, which regulates the range or extent of the whip on the cloth. It is fixed to the upper shell of the lay, immediately below the spring catch. The spaces between the teeth of the rack, exclusive of the thickness of the catch, are each equal to the number of splits of the reed over which the whip is flushed. The needles are made of brass wire, cut to the proper length. They are flattened and pointed at the upper ends, through which a hole is drilled in each for receiving the whip. The other ends are sharpened and driven into the upper edge of the needle shaft, at the same distances as the figures are to stand on the cloth.

Different methods have been adopted for giving the vertical motion to the needle shaft, both in this and the other apparatus for weaving lappets. One of these, which is pretty common, is as follows: a small crank is made by nailing the ends of two pieces of wood together, at right angles, so as to resemble a carpenter's square; pieces cut off the end of an old heddle shaft are commonly used for this purpose. One of these cranks is screwed, by the joint or centre, to the inner edge of each sword of the lay, at the top, with one end standing upright, and the other projecting forward over the needle frame. From these horizontal arms the cords *v v*, descend to the needle shaft, passing through holes in the upper side of the frame, to confine the needles to a vertical direction. Another cord is tied to the upright arm, which is likewise connected to the back cross rail of the loom, or that above the warp roll. When, therefore, the lay is put backward, the tops of the swords, which are above the centre of motion, move in the contrary direction, and the cords which connect the upright arms to the cross rails turn the cranks round on their centres and elevate the arms which are tied to the needle shaft; and, consequently, raise the needles with the whip above the race of the shuttle. When the lay is brought toward the face of the cloth, the cranks resume their former position, and the needle frame sinks again by its own weight.

In front of the needle frame, and immediately behind the race rod, another shaft is suspended, into which is driven a number of brass pins, sharpened into points, and which is raised along with the needle shaft, for a guide to the shuttle, in place of the reed in the common kinds of weaving.

Another method of raising the needle frame, which is considered more simple, is by taking the cords *v v*, over screw pulleys fixed into the swords of the lay, in front, and about half way up; and then tying the other ends of the cords to the cross rail of the loom, above the weaver's head. Here it is evident again, that when the lay is put backwards, the needle frame will be raised by the cords *v v*, passing over the pulleys; and as the lay is brought forward, the needle frame will sink, perfectly clear of the reed, by its own weight.

It has been already observed, that the rack and catch regulate the extent of the range which the whip takes across the warp. For example: Suppose the distance between any two teeth of the rack to be four splits of a 1200 reed, exclusive of the thickness of the catch; then it is evident, that so long as the weaver continued to shift the catch from right to left alternately, between these teeth, the needle frame, and consequently the whip, would be crossed to the same extent below, and raised alternately on each side of the four splits when the lay was put back, and tacked to the face of the cloth by the weft; forming a straight flushed stripe of that breadth, running by the length of the cloth. But were the catch shifted to any other interval of the rack, which is effected merely by the weaver slackening the spring and moving his hand to one side, the needles would be equally shifted below the warp; and by again working the catch between the teeth of the rack in this new position, another flushed stripe would be produced: and thus, by shifting the catch to any part of the rack at pleasure, and varying the extent of these stripes, a great diversity of pattern may be produced on this easy principle. It may be farther observed, that as the needle frame must necessarily rise every time the lay is put back, the weaver must shift the needle frame at the same time; and, consequently, that every shot of the ground weft fastens one thread or ply of the whip to the face of the cloth, but at the alternate sides of the figure.

DOUBLE FRAME LAPPETS.

The first improvement which was made on this method of weaving lappets, was the application of two needle frames so mounted, that when one frame was shifted either to the right or left, the other moved in the contrary direction and reversed the figure. This was effected merely by connecting the two frames at each end, by a cord running over a small pulley, the rack, spring, and other parts of the mounting being the same as for the single frame. The patterns which were woven on this principle, therefore, were produced by first giving the two needle frames an opposite range, by working over the rack in one direction, and returning again till they met in or near the point whence they first started. Sometimes, however, the figures crossed each other at different intervals, and in various forms, and returned in the same or any other order that fancy might suggest.

It has been already observed, however, that so long as the catch continues to work between any two teeth of the rack, the figure produced by each needle will be a stripe of equal breadth throughout; and the only changes which can be effected in the pattern, arise from shifting the catch from one space of the rack to another. Hence, the stiff formality of such patterns, which is inseparable from this process of weaving, is strikingly observable; and will exist as long as the horizontal range of the needles is confined to a determinate space of the reed. To obtain, therefore, a gradual increase and diminution of the range of flushing without shifting from one space to another, was the next desirable object; and this has been completely effected by substituting a wheel for the rack, by the revolution of which, every variety of range can be given to the needle frames which is requisite in this species of weaving.

WHEEL LAPPETS.

In the method of weaving lappets with the wheel, the needle frame is placed in the very same position, and, in general, mounted in the same manner as described under the rack lappets, and which is represented at *n*, Fig. 8, Plate 8. The wheel has a groove, in place of the spaces between the teeth of the rack, cut in one of its flat sides; and this groove varies in its breadth and is extended in length round the wheel, corresponding to the dimensions of the figure which it is to produce. The wheel possesses another capital advantage over the rack, in so much, that when two or more needle frames are necessary, each frame has a groove for itself, by which the formality in the patterns formerly complained of is entirely avoided.

The wheel is fixed by its pivots into a small frame of wood, one side of which extends to the back of one of the swords of the lay, to which it is fastened with screw nails. In place of the rack and spring, there is a wooden rod, connected to each needle frame, which runs in a groove cut in the upper shell of the lay, and in a horizontal line with the centre of the wheel, as represented in Fig. 8. On the end of each rod is fixed a piece of iron, the end of which is bent as at *m*, Fig. 8, so as to work in the groove of the wheel by which the range of the needle frame is limited by the warp. This is called the pick or peck. The circumference of the wheel is divided into a certain number of teeth, which likewise regulate the extent of the pattern by the weft. Above the descending side of the wheel is the catch *o*, or hammer, as it is usually termed, loaded with weights, to bring it down with a force sufficient to turn the wheel one tooth. This hammer is raised, in general, by a couper and long march, connected to the right foot treadle, and sinks again when this treadle is relieved from the foot, by which the wheel is shifted one tooth when the shuttle is in the left box of the lay, but is stationary when in the right box; so that two shots of weft are thrown in for each tooth of the wheel, and the whip is also traversed, first to the left, and again to the right, in the same time, and fastened to the face of the cloth at both sides of the pattern. Nearly in the middle of the shifting rod is the handle *a*, Fig. 8, which the weaver holds in his left hand, by which he gives the horizontal motion to the needle frames, in the same manner as when working with the rack and spring. But when more frames than one are employed, their different motions are given by means of cords connected to their shifting rods, and running over pulleys on the upper shell of the lay. There is another groove round the circumference of the wheel, immediately behind the teeth, in which there is a cord fastened to a spring, by the proper tempering of which, the motion of the wheel is regulated, so that it may be neither too loose nor too tight on its axis. This cord and spring will be seen at *e e*, Fig. 8. Fig. 2, is the representation of a lappet wheel for weaving the pattern Fig. 3; and Fig. 4 is the same pattern on design paper. It is calculated for a twelve hundred reed, and stands on ten splits, with six splits for the plains between the bosoming spots. *i*, Fig. 2, is that part of the groove which produces the spot *i*, Fig. 4, and the other part of the groove, marked *o*, works the bosoming spot *o* in the same Fig.

CUTTING LAPPET WHEELS.

The wheel is made of well-seasoned wood, generally of sycamore, or plaintree, and may be made of any convenient diameter; for that does not affect the pattern, provided it be large enough to prevent confusion where the lines approach the centre. When the wheel is to be made for two or more frames, however, the diameter must be made proportionally larger than for the single frame. The wood is put into a turning lathe, and turned to the requisite thickness and diameter, and the groove is cut out in its circumference for the spring cord formerly mentioned. A number of concentric circles are next described on one of its sides, at the same distances from each other as the splits of the sett of reed for which the pattern is intended. This is the method originally pursued in making lappet wheels; but it is now found more convenient, being less liable to confusion, to mark every second split, only, by a circle, as the half of the intermediate spaces may be easily ascertained by sight, when an odd split is required, as will appear on examining Fig. 2. These circles are described almost instantaneously by a very simple process. While the wheel is in the turning lathe, a piece of thin steel is applied to its side, the edge of which is formed into points, at the same distance from each other as every second split of the given reed. The circumference of the wheel is next divided into as many equal parts for the teeth, as are equal to half the number of weft shots in the pattern, or to the whole number of spaces of the design paper, counted upwards, on which the figure stands: for, as already observed, the needle frame is moved twice by the hand, first to the left and then to the right, for each shifting of the wheel from one tooth to another. It must be observed, however, that it is common in detached figures, both at the beginning and ending, to move the needles over one splitful of the warp only, for the purpose of fastening the whip; and, therefore, in every case where this occurs, there must be one tooth more added to the number, which would otherwise be requisite for the given figure. There is another circumstance that must be attended to in calculating the teeth of these wheels, which is, as the wheel must shift an accommodating tooth while the needles are moving from the right to the left hand bosoming spots, another must be added for this purpose; but this is not necessary when the needles are moving in the contrary direction, as will be more fully illustrated farther on. When the number of the teeth have been thus ascertained and marked off, a straight line or radius is drawn from the centre of the wheel to each of these divisions in the circumference, and then it is ready for cutting the groove.

In order to explain this process, which will greatly assist in illustrating the principles of lappet weaving, we shall take for an example, the pattern and wheel already referred to. Here it will be observed, that the spot Fig. 4, occupies ten spaces of the design paper from right to left, or ten splits of warp; and as every space, counted upward, requires one tooth of the wheel, and is equivalent to two shots of the ground, it follows, that there will be fourteen teeth required for this part of the wheel, and that twenty-eight shots of the ground must be thrown in while this part of the pattern is weaving. But as there is a fastening split both at the beginning and end of this spot, two additional teeth will be necessary for this purpose, and as the same takes place in the bosoming spot, and a tooth added for shifting from one spot to the other, as already noticed, the whole number of teeth for this pattern will be 33, as represented in Fig. 2.

Again, as the concentric or reed circles are here drawn at the distance of two splits of a twelve hundred reed from each other, and the spot occupies ten splits, it is plain that five of these spaces would be the exact breadth of the groove at its greatest extent. But as the thickness of the peck must always be added to the breadth of the groove, which, in this example, is supposed to be four splits, two spaces more must be taken into the account. Then, on the first or bottom space of the design paper, Fig. 4, it will be found that there are six blank squares, counting from the left, between the extremity of the spot *i* and the fastening split, three spaces are therefore counted off on the wheel, from the left, at the beginning of the spot at *a*, Fig. 2; where there is a mark made with a point of the compasses, for one side of the groove. Again, count two spaces more for the diameter of the peck, and add a half space for the fastening split, and make another mark at *e*; and this will point out the breadth of the groove at this tooth of the wheel. As the spot extends two splits to the left and one to the right, on the second space of the design, make a mark at a full space to the left, and a half space to the right, of the wheel; and this will give the breadth of the groove at the second tooth. On the third space of the design, the figure extends two splits more to the left and one to the right; these being marked off as before, will give the breadth of the groove for the third tooth; and so on to *x*, where the groove is again contracted to five splits; that is, four for the peck and one for the fastening split, after which the peck enters the groove of the bosoming spot *o*, which is exactly the same as the preceding, only it is reversed, and its position shifted, six splits clear of the other, for the plain part of the pattern.

When the breadth of the groove is thus marked off for each tooth, the marks are all joined with a black lead pencil; observing, however, that where the groove is either widened or contracted, the changes must be made in the middle of the space of each tooth, that the peck may have the full breadth of the groove to traverse by the time the wheel becomes stationary. This done, the edges of the groove, as marked off with the pencil, are cut out with a chisel and mallet, and the bottom cleared with gouges or other proper instruments.

It was observed in calculating the teeth of the wheel, that an odd tooth was necessary in shifting from one of the bosom spots to the other. This will be better understood by following the dotted line in the groove of the wheel, Fig. 2, which may be taken for the track of the point of the peck in one revolution. Thus, when the weaver commences his operation, the peck is at the right side of the groove, at *e;* and, when the right foot treadle is pressed down, the hammer is raised, the wheel is stationary, and the peck is shifted to the left at *a.* But before the peck returns again to the right side of the groove, the hammer has shifted the wheel one tooth; and, consequently, the peck will now touch the side of the groove at the point *v.* By tracing the dotted line still farther, it will be found that the peck will shift directly from *x* to *u*, by moving the wheel only one tooth, as in the other parts of the pattern. But when it arrives at *w*, which is the end of the spot, its next position should be at *e*, where the other spot begins; but as this would interrupt the reciprocating motion of the needle frame, the tooth above mentioned is added, and its next position is at *z*, and must return again to the left side of the groove *y*, before it can arrive at the beginning of the spot.

WHEELS FOR TWO FRAMES.

From the preceding description, it will appear, that any figure, within a moderate compass, may be produced with the lappet wheel and one needle frame, provided such figures be solid, or that the spaces on the design paper be entire from right to left: for if the figure be broken into two, three, or more parts in its horizontal range, one frame will be necessary for every such part.

Fig. 5 is a pattern for two needle frames, adapted to a 14 hundred reed, and Fig. 6 is the same on design paper. As this figure is open in the centre, it is evident that two needle frames will be requisite, and these work in contrary directions, one on each side of the centre, coming into contact and receding from each other, alternately. Fig. 7 is a representation of the wheel for this pattern, on which there are two grooves, one for the peck of each frame; and these grooves are placed at such a distance from each other, as is necessary to secure the wood between them from being broken; the shifting rod of the inside groove being so much longer than the other, as to fit that distance. The figures in this example are not bosomed, as in the preceding, otherwise the wheel must have been considerably larger. As the two needle frames move always in contrary directions, they are commonly mounted in the manner explained under the rack double frame.

By examining Fig. 6, it will be found that the spot stands upon 22 splits, or 11 splits for the range of each needle. From the left extremity of the spot to the fastening split, on the design paper, there are six blank spaces; therefore three of the circular spaces on the wheel are counted off, and a mark made for one side of the groove; and as there are in this example, six splits allowed for the diameter of the peck, three spaces, together with a half space for the fastening split, are added, and a mark made for the other side of the groove at this tooth of the wheel; and so on with the others, as in the foregoing example. The other groove is marked off in the very same manner, only reversed; that is, the side next the centre of the wheel of the inside groove is the same as the side next the circumference of the other.

DROPPED FRAMES.

Fig. 9 is a pattern for three needle frames, and Fig. 10 is its representation on design paper. In this pattern it will be observed, that the needle frame for the small colonade is constantly working, while the other two which produce the sprig are occasionally at rest. When the working of any of the frames is omitted for a time, in this manner, such frames are said to be dropped. In weaving patterns of this kind, the needle frame which is constantly working is usually raised in the manner formerly described; but those that are occasionally dropped must be mounted separately. The common method of raising these needles is, by means of a couper and long march, which last is connected to tongues, or small pieces of wood attached to the treadles; so that, when the weaver shifts his feet forward on the tongues, the frames are raised, and the needles produce the figures; but as soon as he shifts his feet a little backward on the treadles, clear of the tongues, the needles are dropped. In calculating the needles for this pattern, it must observed, that the range for one set extends only from *a* to *e;* for the second stripe is added merely to show the position of the first needle of the second set, or the manner in which the pattern joins.

It may be further observed, that although Fig. 6 is given merely as an example of a double frame lappet, it might have been ranked among those of the dropped kind, as the figures stand detached, with plain spaces intervening, both by the warp and weft. When the whole of the frames, however, are thus omitted at the same time, it is not necessary to make any alteration in the mode in which they are mounted; for the needles can be raised and dropped at pleasure, by raising the hammer with a tongue attached to the right foot treadle. These observations apply likewise to patterns which require a greater number of frames, some of which have been lately made with six grooves in the wheel.

When lappets are made into shawls, there are one set of needle frames requisite for the side border, and another for the cross border and centre. As the spots in the centre, however, are always thinner than those of the borders, part of the cross border needles must be dropped during the whole of the time the centre is weaving. But as the spots thus omitted are usually the same as those which are continued, there is, in such cases, no occasion for an additional groove in the wheel; for the two needle shafts are placed into one frame, one above the other; and the needles of the under shaft, which pass through holes made in the upper one, are so much longer, that their points are in the same horizontal line when the two shafts are in contact; so that both shafts are raised and sunk together in working the cross border, but the under one is always sunk in weaving the centre.

Having explained, at considerable length, the construction and use of the lappet wheel, it will next be necessary to take some notice of the method of arranging the needles, so as to produce the requisite diversity of pattern. If we take, for example, the pattern Fig. 4, we will find that there are ten splits in each of the bosoming spots, and six in each of the intervening plains, which make in whole 32 splits for the range or space allotted to each needle. As the needles, in this, are all placed at equal distances, we have only to divide the quantity of warp in the web by 32, to find the number of needles, and, consequently, the number of ends of the whip which will be requisite for this pattern. Thus, suppose the cloth to be five-fourths broad, or 1500 splits of a 12 hundred reed; then

32) 1500 (46
128
220
192
28

Here we have 46 of a quotient and 28 splits over; so that by adding a few splits we will have 47 needles, or by throwing a few away, we will have 46; making, in either case, a sufficient allowance for the selvages. Again, if 32 splits be taken in a pair of dividers, from the reed scale, for a 1200, and set off along the edge of the needle shaft, each mark left by the points of the dividers, will show where a needle is to be inserted.

When the needles are set at unequal distances, one whole set of the pattern may be formed, as above, and again subdivided, agreeably to the different positions of the needles. The same is to be understood when more than one needle shaft is employed, for the position of the needles of each shaft must be found to suit the particular space allotted to it in the pattern; and the whole must be so arranged, by adapting them to their respective shifting rods, as produce the desired effect.

Although it has been observed, that patterns may be woven by means of the lappet wheel to any extent; yet this must be understood in a very limited sense: for, as the whip is never interwoven with the cloth, except at the extremities of the figures, it is evident, that, by giving it too much lateral range, the objects produced would be loose and flabby, and liable to be caught and torn out by every thing with which it came in contact. A method has, indeed, been attempted, of fastening the whip in the middle of large objects; which is, by raising a fine thread the same as the warp, by an additional needle frame, at each traverse of the whip along the face of the cloth. But this contrivance does not seem to have been attended with any material advantage, since it is now entirely neglected.

The method of traversing the lappet whip across the warp, in front of the reed, would naturally suggest the idea of crossing the whip of nets, likewise, with needles; by which a variety of patterns might be produced without heddles, as formerly noticed. For suppose we take two needle shafts, one with the needles upright, in the usual way, the other with their points downward, and a thread of warp drawn through the eye of each; then, if the upper shaft be shifted a little to one side, and the needles sunk on the right of those in the under shaft, so as to open a shed to receive a shot of weft; and, again, if the upper needles be raised, shifted in the contrary direction, and sunk on the left of the others, forming a shed for another shot of weft; the texture thus produced would be the common plain gauze. Hence it is easy to conceive, that, by extending the range of the needles a little further, in each direction, or by increasing the number of needle shafts, varying their motions, and sometimes omitting to raise or sink any number of the needles, all that variety of net patterns may be produced which have lately made their appearance in the market. But as the proprietors of this invention are still disposed to keep their process a secret, a detailed account of it cannot be given in this place.

CHAP. VIII.

SPOTTING.

In all the preceding branches of weaving, the figures or patterns are formed by the several modes in which the warp and weft are interwoven, or flushed over each other. In this extensive branch of manufacture, however, the spots or figures are woven on the cloth by incorporating the spotting, and in some instances, the stripping, with certain portions of the ground; and those parts which are flushed over the intervals, in most of the kinds, are afterwards cut away. The spotting yarn is coarser than that which composes the ground, sometimes coloured, and is usually two or more ends wound together, without any twist.

Spots which are woven on a plain ground or texture, are usually divided into two kinds, namely, the *common spot* and the *paper spot;* for, on any other ground, this distinction is unnecessary.

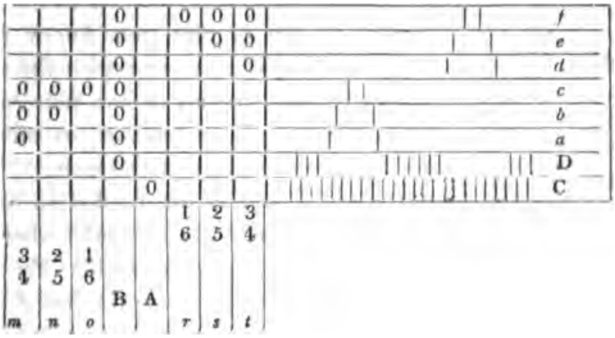
SECT. I. COMMON SPOTS.

The mounting of a common spot consists of the *fore leaf*, the *ground leaf*, and the *spotting leaves* by which the patterns are produced. The fore leaf contains that half of the warp which would have been drawn on the front leaf of a plain web; and the ground and spotting leaves, taken together contain the other half; so that, on the ground leaf are drawn those portions of the warp, only, which fall into the intervals between the spots.

By an attentive perusal of the following plan, and its description, the principle on which common spots are woven will become obvious: it is the draught and cording of what is called a

ROUND SPOT.

No. 1. Fig. 1. Plate 9.



In this plan, which contains six spotting, and two plain leaves, the letter C points out the fore leaf, D the ground leaf, and the small letters *a*, *b*, *c*, *d*, *e*, and *f*, the spotting leaves respectively. The leaves *a*, *b*, and *c*, however, are sufficient to form the figure; but, as it is common in spot weaving to throw one row of spots into the bosom of the other, as in the figure on design paper accompanying this example, the leaves *d*, *e*, *f*, are added for this purpose.

It will appear by the marks on the draught, each of which denotes one thread of warp, that there are three splitfuls of plain, drawn in alternate threads on the ground and fore leaves D and C, exclusive of selvages, which are considered separately from the warp, and are also drawn on these two leaves. Then the first thread of the spot is drawn on the spotting leaf *d*, and the other thread of the same splitf on the fore leaf. The second thread of the spot is drawn on the leaf *e*, and another thread to complete the splitful on the fore leaf. The third spotting thread is drawn on the leaf *f*, and another on the fore leaf; and so on with the other half of the spot. The next part of the draught contains six splitfuls of plain, because there are six splits in the extent of the spot; or, in other words, the spot is said to stand upon six splits: and this makes what is termed a *half cover*. Then we come to the bosoming spot, which is drawn, in every respect, in the same manner as the first, but upon the leaves, *a*, *b*, and *c;* and then follow three splits of plain to make a complete interval with the three first drawn: and this constitutes one set of the pattern, or once over the draught, which is to be repeated as often as necessary to produce the given breadth of the web.

Again, the two treadles A and B are corded to weave plain cloth: A raises the fore leaf C and sinks the others; B raises the ground and spotting leaves, and sinks the fore leaf. The spotting treadle *r* raises the point leaf *f*, and sinks all the warp except what is drawn on that leaf; the treadle *s* raises the leaves *e* and *f*, sinking the others; and the treadle *t* raises the three spotting leaves *f*, *e*, and *d;* and thus one half of the spot is produced, the other half being formed by reversing this order of treading, as pointed out by the figures on the treadles. This finishes one row of the spots, and the bosoming one is produced, in like manner, by the treadles *m*, *n*, *o*.

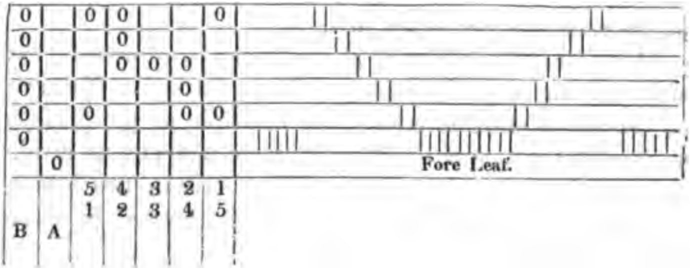
In all patterns woven on the common spot principle, there are two shots of fine weft thrown across, on the plain treadles, for each shot of spotting, in order to reverse the plain sheds, and complete the texture of the ground below the spot. In this example, therefore, after throwing across a shot of spotting on the treadle *r*, the weaver works two shots of fine on the treadles A and B for the ground; then another coarse shot on *s*, and two fine on A and B; and so forth with the remaining part of the spot. After weaving twelve shots of fine for the plain, which, in this example, is of the same extent as the spot, the bosoming row is woven in the same manner as the first.

Of this and the following plans, it may be observed, that although the warp of the plain parts be marked as if drawn on two leaves only, to render the principle as perspicuous as possible; yet it is usual, as in plain weaving, to divide the warps of C and D, respectively, between two leaves, that the heddles may not be too much crowded in those parts.

Common spots are usually designed on 10 by 10 paper, except considerably more weft than warp be required, in which case, either 8 by 9 or 8 by 10 may be employed; and as one thread, only, of each splitful rises in the formation of the spotting sheds, each space on the design paper, running vertically, will represent one splitful, or two threads of warp. Again, as there are two shots of fine or ground thrown in for each shot of spotting, these three threads will likewise be included in one space from right to left.

In looking back on the different methods of varying the draughts and cordings which have been explained in the preceding chapters, it will readily be perceived, that an extensive variety of patterns may likewise be produced on this principle. It will only be necessary, however, in what follows, to explain those forms of mounting which are of most use in practice. In the following examples, two threads are drawn on each spotting leaf; but, instead of the spots being embosomed, as in the preceding plan, they stand in an inverted position in the same row.

No. 2. **Fig. 2.** **Plate. 9.**



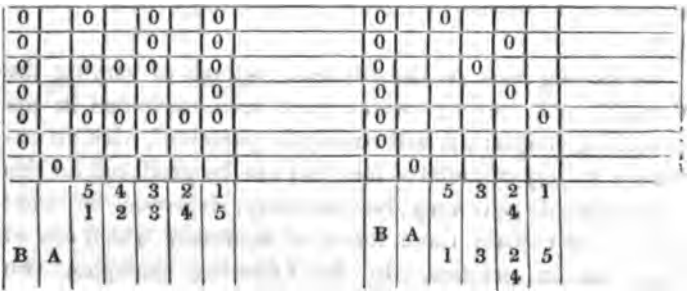
No. 3.

Fig. 3.

No. 4.

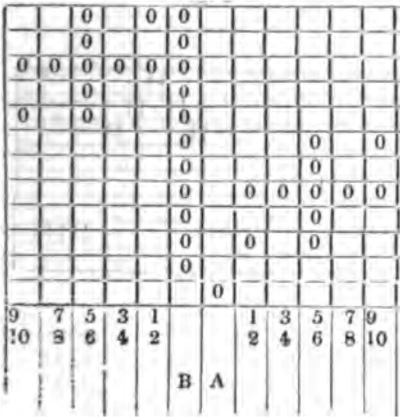
Fig. 4.

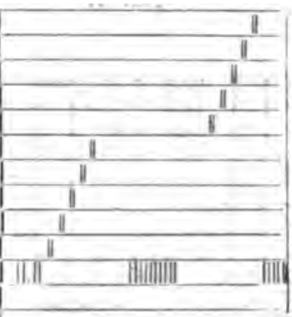
Draught same as No. 2.



In the following plans the figures are bosomed, which, consequently, require double the number of spotting leaves. To save room on the Plate, however, only one spot of each pattern is drawn. These and the eight following Nos. have two shots of spotting on each treadle.

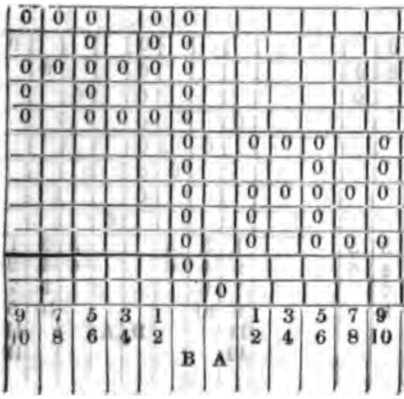
No. 5. **Fig. 5.**





No. 6. **Fig. 6.**

Draught same as No. 5.



No. 7. Fig. 7.

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			0			0	
			0		0		
0			0				
	0		0				
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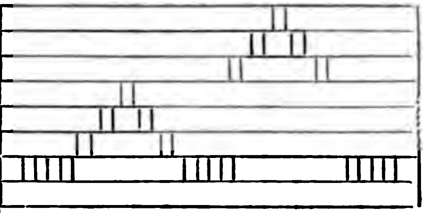
				0			
5 6	3 4 7 8	1 2 9 10	B	A	1 2 9 10	3 4 7 8	5 6



No. 8. No. 9.

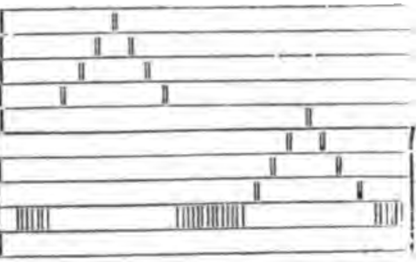
Fig. 8. Draught same as No. 7. Fig. 9.

			0		0	0		
			0			0	0	
			0				0	
	0	0	0					
0	0		0					
0			0					
			0					
				0				
5 6	3 4 7 8	1 2 9 10	B	A	1 2 9 10	3 4 7 8	5 6	

			0				0	
			0			0		
			0		0			
0			0					
	0		0					
		0	0					
			0					
				0				
1 2 7 8 11 12	3 4 9 10	5 6	B	A	5 6	3 4 9 10	1 2 7 8 11 12	

No. 10. **Fig. 10.**

0		0	0				
0			0				
	0		0				
0			0				
			0		0		0
			0				0
			0			0	
			0				0
			0				
				0			
7 8	3 4 11 12	1 2 5 6 9 10 13 14	B	A	1 2 5 6 9 10 13 14	3 4 11 12	7 8

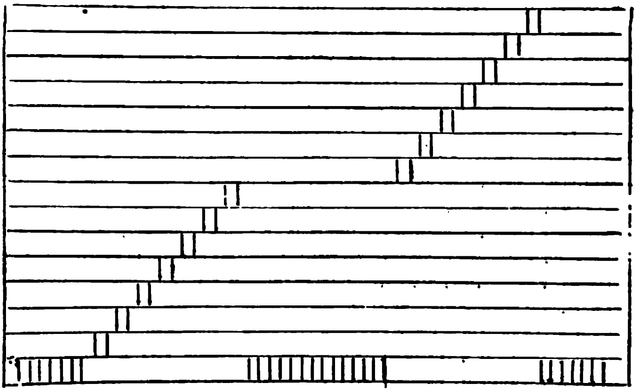


No. 11. **Fig. 11.**

Draught same as No. 10.

				0		0	0	0	
				0				0	0
				0			0		0
				0					0
	0	0	0	0					
0	0			0					
0		0		0					
0				0					
				0					
					0				
7 8	5 6 9 10	3 4 11 12	1 2 13 14	B	A	1 2 13 14	3 4 11 12	5 6 9 10	7 8

No. 12. Fig. 12. Draught.



No. 12. CORDING.

							0						0	0	0
							0								0
							0				0	0	0		0
							0						0		
							0		0	0	0		0		
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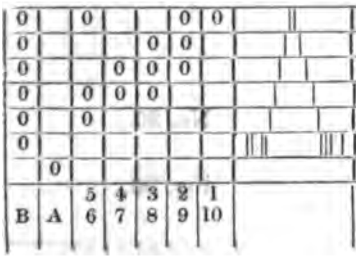
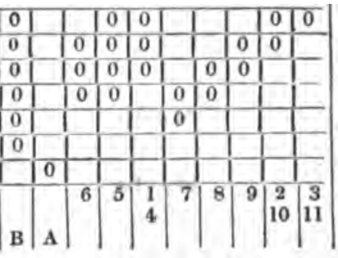
							0		0		0				
				0		0	0								
				0			0								
		0		0	0	0	0								
		0					0								
0		0	0	0			0								
0							0								
0	0	0					0								
							0								
								0							
1 2	3 4	5 6	7 8	9 10	11 12	13 14	B	A	13 14	11 12	9 10	7 8	5 6	3 4	1 2

These examples will give the reader some idea of the manner in which spot mountings may be diversified. But, as the diamond draught, of which No. 1 is an example on a small scale, is of most frequent use, both for common and paper spots, it will be of great advantage to the tradesman to be able to produce a variety of patterns from any given mounting of this form. The following example, in which thirty varieties are given, by a mounting of five spotting leaves, will show how this may be effected. In these plans, the draughts and cordings are made for one row of spots, only; but the bosoming spots may be easily supplied, if necessary. The draught is the same for all these patterns to No. 42, and need not be repeated.

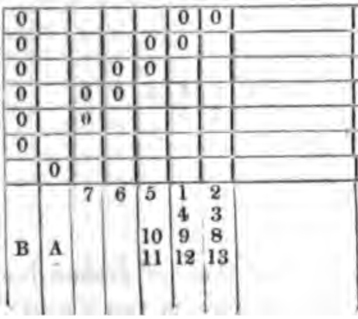
No. 13. Fig. 13.



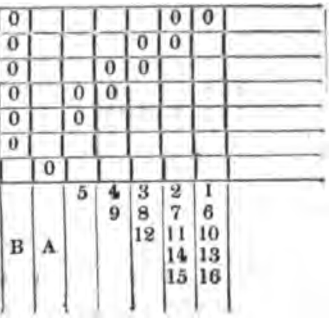
No. 14. Fig. 14.



No. 15. Fig. 15.



No. 16. Fig. 16.



No. 17.

Fig. 17.

0		0			0	0	
0				0	0		
0			0	0			
0		0	0				
0		0					
0							
	0						
B	A	4 12	5 11	6 10	2 3 7 9 13 14	1 8 15	

No. 18

Fig. 18.

0					0	0	
0				0	0		
0			0	0			
0		0	0				
0		0					
0							
	0						
B	A	5 10	4 9	3 8	2 7 12 13	1 6 11 14	

No. 19.

Fig. 19.

0				0	0	0	
0			0	0	0		
0		0	0	0	0		
0		0	0	0			
0			0	0			
0							
	0						
B	A	4 7	5 6	3 8	2 9	1 10	

No. 20.

Fig. 20.

0				0	0	0	0	0	
0			0	0	0	0	0		
0		0	0	0	0	0			
0		0	0	0	0				
0			0	0					
0									
	0								
B	A	9	8	6 7	4 5	3	2	1	

Note. In Figure 19 there are four shots of ground between the spotting shots, if a plain texture, or two if gauze.

No. 21.

Fig. 21.

0		0	0	0	0	0	0	
0			0	0	0	0		
0		0	0	0	0			
0		0	0	0				
0			0					
0								
	0							
B	A	2 5	3 4 10	9	8 13 14	7 12 15	1 6 11 16	

No. 22.

Fig. 22.

0				0	0	0	0	0		
0			0	0	0	0	0			
0		0	0	0	0	0				
0		0	0	0	0					
0			0	0						
0										
	0									
B	A	9 12	10 11	8	7	1 6	2 5 14 15	3 4 13 16		

No. 23.

Fig. 23.

0					0	
0		0	0	0		
0		0	0	0		
0		0	0			
0		0				
0						
	0					
B	A	3 4 7 8	2 9	1 10	5 6	

No. 24.

Fig. 24.

0						0	
0			0	0	0		
0		0	0	0	0		
0		0	0	0			
0			0				
0							
	0						
B	A	1 12	2 3 10 11	4 9	5 8	6 7	

No. 25.

Fig. 25.

0					0
0			0	0	
0			0	0	
0		0	0	0	
0		0	0		
0					
	0				
B	A	1 10	2 9	3 4 7 8	5 6

No. 26.

Fig. 26.

0		0			
0		0	0	0	0
0		0	0	0	0
0		0	0	0	
0		0	0		
0					
	0				
B	A	4 5 6	3 7	2 8	1 9

No. 27.

Fig. 27.

0		0	0	0	0	0
0		0	0	0	0	
0		0	0	0		
0		0	0			
0		0				
0						
	0					
B	A	8	7 9	6 10	2 3 5 11	1 4 12

No. 28.

Fig. 28.

0		0	0	0	0	0
0		0	0	0	0	
0		0	0	0		
0		0	0			
0		0				
0						
	0					
B	A	5 6	4 7	3 8	2 9	1 10

No. 29.

Fig. 29.

0		0	0	0	0	0
0		0	0	0	0	
0		0	0	0		
0		0	0			
0		0				
0						
	0					
B	A	6 7 8	4 5	3	2 9	1 10 11

No. 30.

Fig. 30.

0		0	0	0	0	0
0		0	0	0	0	
0		0	0	0		
0		0	0			
0		0				
0						
	0					
B	A	9	8	4 7	3 6 11 12	1 2 5 10 13

No. 31.

Fig. 31.

0		0	0	0	0	0
0		0	0	0	0	
0		0	0	0		
0		0	0			
0		0				
0						
	0					
B	A	5 6	4 7	8	3 9	1 2 10

No. 32.

Fig. 32.

0		0	0	0	0
0		0	0	0	
0		0	0		
0		0			
0		0			
0					
	0				
B	A	7 8	3 4 11 12	2 5 10 13	1 6 9 14

No. 33.

Fig. 33.

0		0	0	0	0	0	
0		0	0	0	0		
0		0	0	0			
0		0	0				
0		0					
0							
	0						
B	A	5 6	4 7	3 8	2 9	1 10	

No. 34.

Fig. 34.

0		0	0	0	0	0	
0		0	0	0	0		
0		0	0	0			
0		0	0				
0		0					
0							
	0						
B	A	5 6 7	4 8	3 9	2 3 2 10 13 14	1 4 1 11 12 15	

No. 35.

Fig. 35.

0		0	0	0	0	
0		0	0	0		
0		0	0	0		
0		0	0			
0		0				
0						
	0					
B	A	5 6	3 4 7 8	2 9	1 10	

No. 36.

Fig. 36.

0		0	0	0	0	0	
0		0	0	0	0		
0		0	0	0			
0		0	0				
0		0					
0							
	0						
B	A	1 6 7 12	2 11	3 10	4 9	5 8	

No. 37. Fig. 37.

0		0	0	0	0	
0		0		0		
0		0	0			
0		0	0			
0		0				
0						
	0					
B	A	6 7	5 8	2 3 10 11	1 4 9 12	

No. 38. Fig. 38.

0		0	0	0	0	
0		0		0		
0		0	0			
0		0	0			
0		0				
0						
	0					
B	A	4 5	3 6	8 9	1 2 7 10	

No. 39. Fig. 39.

0					0	0	
0		0		0	0		
0		0	0	0			
0		0	0				
0		0					
0							
	0						
B	A	2 3 11 12	1 4 10 13	5 9	6 8	7	

No. 40. Fig. 40.

0						0	0	0	0
0		0			0	0	0	0	
0		0		0	0	0	0		
0			0	0	0	0			
0			0						
0									
	0								
B	A	1	11	10	9	5 6 7 8	4 14 15	2 13 16	3 12 17

No. 41. Fig. 41.

0					0	0	0	0
0				0	0	0	0	
0			0	0	0	0		
0		0	0	0	0			
0		0						
0								
	0							
B	A	8	7	6	4 5	3	10 11	1 2 9 12

No. 42. Fig. 42.

0					0	0	0	0	
0				0	0	0	0		
0			0	0	0	0	0		
0		0	0	0	0	0			
0		0			0				
0									
	0								
B	A	10	9	8	5 6	4 7	3	1 2	

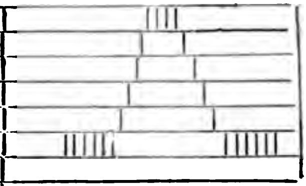
It is sometimes of advantage to the weaver to have a draught made upon a larger scale than is barely necessary for the intended pattern. By this means he has it in his power to increase the variety of pattern considerably, without incurring the expense of many different mountings. For this reason, Figs. 23, 25, 26, 32, 35, 37, and 38, are included among the preceding specimens, although it must be obvious that they could be woven with only four spotting leaves.

If four threads be drawn on the point leaf, instead of two, in the preceding mounting, other varieties will be obtained, of which the following are given as examples.

No. 43.

0				0	0	0
0			0	0	0	
0		0	0	0		
0		0	0			
0		0				
0						
	0					
B	A	5 6 7 8	4 9	3 10	2 11	1 12

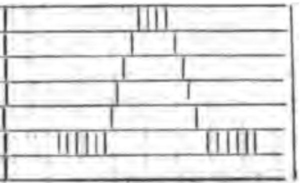
Fig. 43.



No. 44.

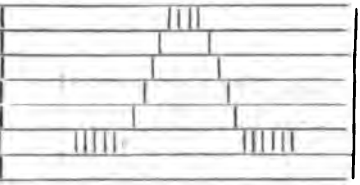
0					0	0
0				0	0	
0			0	0	0	
0		0	0	0		
0		0				
0						
	0					
B	A	5 6 7 8	4 9	3 10	2 11	1 12

Fig. 44.



No. 45. **Fig. 45.**

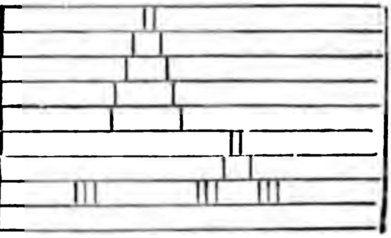
0			0	0				0	0
0		0	0				0	0	
0		0				0	0		
0		0	0	0	0	0			
0		0	0	0	0				
0									
	0								
B	A	8 10	7 11	6 12	5 13	4 9 14	3 15	2 16	1 17



Spots of this or larger size are frequently embosomed with some inferior figure, such as a barley-corn, club, or round drop, which will require only one, two, or three leaves; by which means, mountings may be considerably reduced, while, at the same time, they are capable of producing a very extensive variety of pattern. The two following plans will suffice for examples.

No. 46. **Fig. 46.**

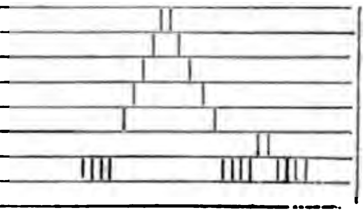
0		0	0					0
0		0				0		
0					0	0		
0			0	0	0			
0			0	0				
0							0	0
0								0
0								
	0							
B	A	11 12	10 13	9 14	7 8 15 16	5 6 17 18	1 4	2 3



No. 47.

0		0	0	0	0	0	0
0		0	0	0	0	0	
0		0	0	0	0		
0			0	0			
0			0				
0			0	0	0	0	0
0							
	0						
B	A	19 20	7 8 9 10	5 6 11 12	3 4 13 14	18 21	1 2 15 16 17 22

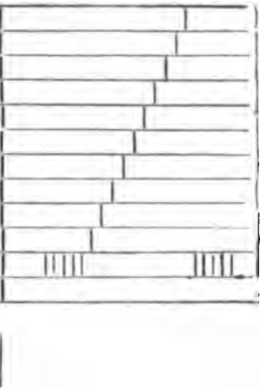
Fig. 47.



It is observable of the diamond draught, that whatever variety of figures it can produce, they are always alike on each side, or diverge, as it were from a centre. There is another spot draught, however, which obviates this formal appearance of these figures, but which requires double the number of spotting leaves to produce a pattern of the same extent. This draught runs straight over the leaves like the draught of a regular tweel; by which each thread of the spot may be raised independently of the others, and any variety can be produced within the limits of the draught. This mounting, however, owing to the number of leaves requisite for a spot of but moderate size, is not in such general use as the diamond draught. The two following examples will show the effect of this mounting.

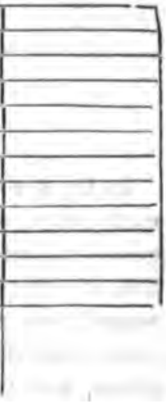
No. 48. **Fig. 48.**

0									0	0		
0		0						0	0	0	0	
0		0					0	0	0	0	0	0
0		0	0			0	0	0	0	0	0	0
0		0	0	0	0	0	0	0	0	0	0	0
0			0	0	0	0	0	0	0	0	0	0
0			0	0	0	0	0	0	0	0	0	
0				0	0	0	0	0	0	0	0	
0					0	0	0	0	0	0		
0						0	0	0	0			
0												
	0											
A	B	14	13	12	10 11	9	8	7	5 6	3 4	2	1



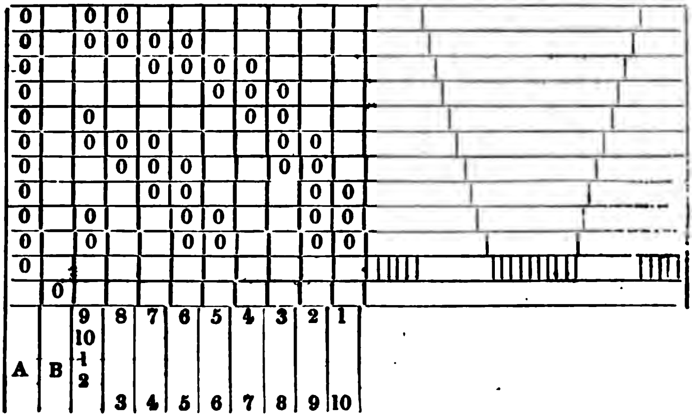
No. 49. **Draught No. 48.** **Fig. 49.**

0									0	0	0	0			
0								0	0	0	0	0	0		
0		0					0	0	0	0	0	0	0	0	
0		0				0	0	0	0	0	0	0	0	0	
0		0	0		0	0	0	0	0	0	0	0	0	0	0
0		0	0	0	0	0	0	0	0	0	0	0		0	0
0			0	0	0	0	0	0	0	0	0				0
0			0	0	0	0	0	0	0	0					0
0				0	0	0	0	0	0						
0					0	0	0	0							
0															
	0														
A	B	16	15	13 14	12	11	10	9	8	7	6	5	3 4	2	1



The cordings of these spots are given, that they may be compared with those of the diamond draught; but as patterns of this kind require double the number of spotting leaves, they are seldom woven with treadles, but by the machines already described, the application of which will be explained under paper spots. The same variety of pattern may be woven without the embosoming leaves, if the draught be reversed, as in the following plan, the effect of which may be seen by taking it off on design paper.

No. 50.



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0				0	0				0	0
0		0			0	0			0	0
0		0			0	0			0	0
0										
	0									
A	B	9 10 1 2	8 3	7 4	6 5	5 6	4 7	3 8	2 9	1 10

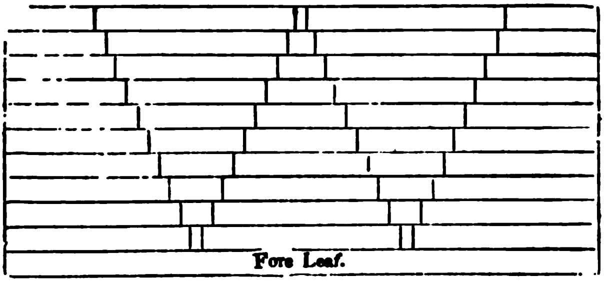
SECT. II. ALLOVER SPOTS.

In the preceding spots, the figures stand detached from each other, with portions of intervening plain, which is generally calculated for half cover; although this proportion of cover is not always adopted, but varies with the intended richness of the pattern. When the draughts of the spots, however, are connected together without any such plains, and the spotting continued without intervals, the pattern is said to be an allover, or full cover. Hence, as the selvages, only, are woven plain, the ground leaf is retained merely for a few heddles on each side for this purpose.

The draughts of allovers, like those of detached spots, are of various forms; but that which is in most use is the diamond draught, an example of which is here given.

No. 51. Fig. 50.

Draught.



No. 51. CORDING.

0	0	0	0	0	0	0	0						0	0	0	
0	0	0	0	0	0		0								0	
0	0	0	0	0			0								0	
0	0	0	0				0		0							
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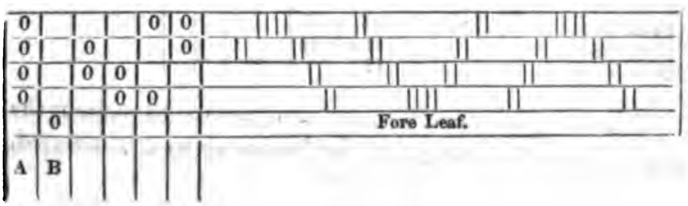
						0	0		0	0	0	0	0	0		
				0	0	0	0		0	0	0	0	0	0	0	
								0								
23 24 25 26	21 22 27	19 20 28	18	17	16	15	A	B	9 10 11 12	7 8 13	5 6 14	4	3	2	1	

This draught is, in effect, the same as No. 13 without the plains; only the draught of the bosoming spot is inverted, that the plan of cording may appear to more advantage. By this arrangement we have the power of twenty splits with only ten leaves; and therefore, any similar sided figure, to the extent of that space, may be woven with this mounting. We also see by the design, that when distinct figures are produced by this mounting, one row of these figures may overlap or run a considerable way into the bosom of the other, both by the warp and weft: and what one spot, in such cases, takes more than its own proportion of the draught, is said to be borrowed from the other; and also, whatever part of the one spot is woven before the other is finished, has its raising cords tied on the opposite side of the treadles, as exhibited in the above plan.

This pattern, as well as the other spots, is corded to be woven solid, where there is no clipping; but large figures of this kind are sometimes flushed or diced, as represented in Fig. 51.

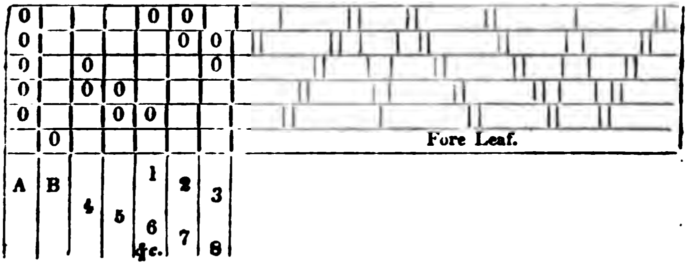
It may be observed, that the single over and over draught, No. 48, cannot be employed for allovers with any degree of advantage, until it be extended to a harness. There are, however, other methods of making a great diversity in allover spots, by varying the order of the draught, as in lined work, where the double, triple, &c. draughts are explained: or by the more varied form of the diaper draught, as exemplified under crape. The following is a plan of an allover spot mounting, with a double draught, the pattern of which may be easily traced on design paper, by making the spot treading follow the same order as the draught on the leaves.

No. 52.



The following plan admits of still greater diversity; and the figure may also be exhibited on design paper, by following the directions given, under diaper.

No. 53.



To adapt this and some of the other diaper patterns to the common spot, it must be observed, that, in some of the points, only one thread of the warp is raised, as is never the case in this species of weaving, because it does not take a sufficient hold of the spotting. This may be obviated, however, by doubling or tripling the number of draughts on each leaf, according as the web is of fineness; or if more minuteness and delicacy be required, a warp thread of cording may be introduced for the points, and wrought out when it is not requisite in the figure, after the manner of a cut stripe.

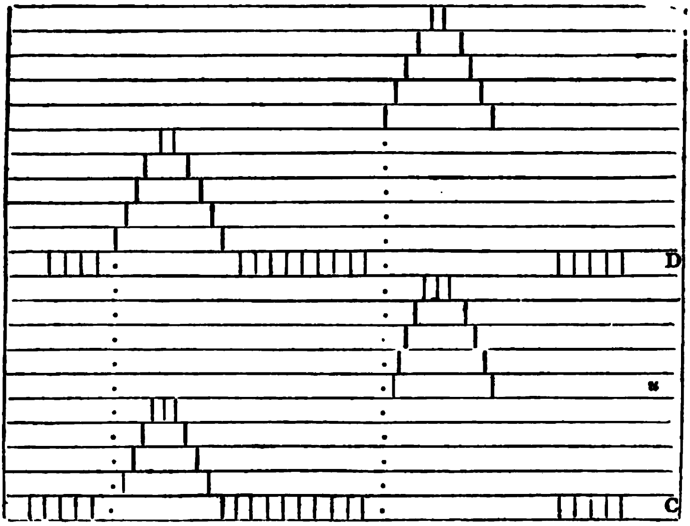
SECT. III. PAPER SPOTS, JAPAN SPOTS, OR BROCADES.

It has been already observed, that in the common spot mounting, one half of the warp is drawn on the ground and spotting leaves, and the other half on the fore leaf; by which two shots of the ground are necessary to bind each shot of spotting. In paper spots, however, that half of the warp, which, in common spots belongs to the front leaf, is drawn on a corresponding set of spot mounting; and the spotting sheds are formed, alternately, from the back and front sets. By this arrangement, each shot of spotting is sufficiently fastened by one shot only, of the ground: for, from whatever set the leaves are raised to form any of the spotting sheds, that shed will be reversed, by raising the other set for the following shed of the ground: and thus, by allowing the spotting weft to go much closer together than in the common spot, the figures have a more rich and solid appearance, which, probably, has procured them the name of paper spots.

The annexed plan of a paper spot mounting, which is adapted to the very same figures which are produced by the draught of No. 13, will give a comparative view of these two species of spot weaving.

PAPER SPOT DRAUGHT.

No. 54. Fig. 52.



No. 54. CORDING.

										0	0		0		0		0		0	
										0			0		0		0		0	
										0					0		0		0	
										0							0		0	
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	0		0		0		0		0											
	0		0		0				0											
	0		0						0											
	0								0											
									0											C
9	8	7	6	5	4	3	2	1	B	A	1	2	3	4	5	6	7	8	9	

In this example, the ground leaves of the two sets are marked C and D, respectively; and the treadles for weaving the ground are marked A and B. As one half of the warp, or all the odd threads as they occur in the draught, are drawn on the back set of spotting leaves and ground leaf D, and the other half, or even numbers, are drawn on the front set and ground leaf C; it follows, that when these two sets with their ground leaves are raised alternately, plain cloth will be produced, agreeably to the cording on the treadles A and B.

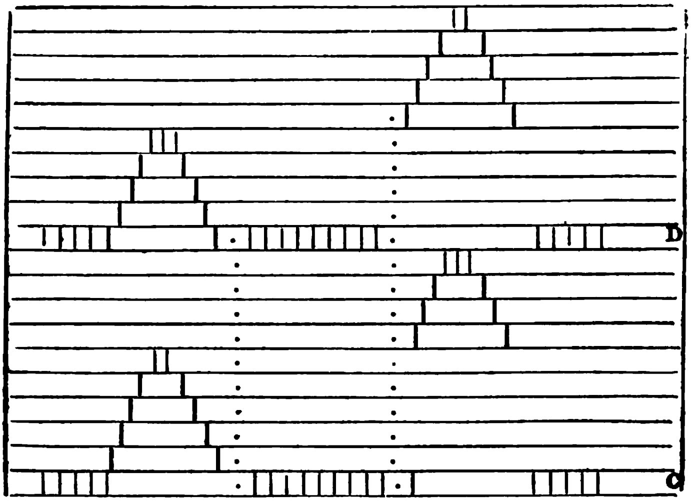
Again, when a shot of spotting is thrown into the shed formed by the treadle 1 of the right hand set, which raises a spotting leaf of the back set, the treadle B is pressed down for the succeeding shot of the ground, which reverses that part of the spotting warp that was raised by this leaf. The next spotting treadle is 2, which raises one of the spotting leaves of the front set; but, to reverse the warp for the next ground shot, the treadle A must be pressed down; and so on, forming the spotting sheds from the back and front sets, alternately, and raising the contrary set for the following shot of the ground.

The principal consideration in making draughts and cordings for paper spots, is, to avoid a defect in the figures which is commonly known among tradesmen by the name of *teething*. In order to explain this, it must be observed, that if the two sets of spotting leaves were exactly similar, or, that the corresponding leaves on the back and fore sets were to raise the same number of threads, one side of the figure would increase or decrease by single threads, while the other side would be indented in the manner exhibited in Fig. 52, letter B. For, suppose the two point leaves of the preceding mounting to raise two threads each, instead of the present form; then, as the first spotting shed is opened by the back point leaf, which raises the right hand thread in each interval of the reed; and the second, by the point leaf of the front set, which raises the left hand threads; it will follow, that a regular figure would be formed, extending, by single threads, towards the left side of the web. But the third shed would consist of four threads, which are raised by the back point leaf and the one next it; consequently, two of these will continue the diagonal towards the left, while the other two will extend towards the right: and all the four threads of the fourth shed will again incline to the left; and so on, alternately. Hence, all the members of any pattern produced by a mounting or harness of this description, will be regular, or extend by single threads towards the left; but such members as run towards the right will advance by two threads at once, and thus produce that rugged appearance which has obtained the appellation of teething; probably from its resembling the indentations of a saw. But this defect is entirely obviated by introducing an odd thread into the point leaf of one set of the mounting, as in the example given above; and its effect will be the same as represented at A, Fig. 52.

The introduction of this odd thread into the paper spot draught causes some deviation, in taking in the warp, from that regularity which is observable in common spots: for it will appear by examining the draught of No. 54, that there are five full splits drawn on the ground leaves D and C, beginning on the leaf D, before the spot part of the draught commences. Then, the first thread of the spot is drawn on the leaf *e*, the second on the leaf *u;* and so on, to the last thread of the spot, which is drawn on the leaf *e;* so that both the first and last threads of this spot belong to the back set. Hence, it is evident, that the first thread of the following plain must be drawn on the fore ground leaf C, and be taken into the same interval of the reed with the last thread of the spot to complete the splitful. The draught then proceeds in regular order to the last thread of the bosom spot, which requires, in like manner, another thread to be drawn on the leaf C to fill the split.

The following plan will exhibit another method of arranging the leaves of a paper spot, in which, it will be observed, that the number of spotting leaves in each set is equal. The cording may be supplied by comparing it with that of No. 54.

No. 55.

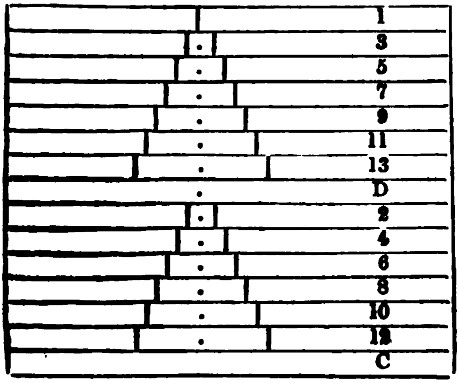


The texture of the figure in this example, which was originally called the paper spot, is similar to that of plain cloth, and which, as formerly noticed, is more rich and solid than that produced by the common spot mountings. Paper spot mountings, however, possess another important advantage over those of the common kind; which is, that although the latter may be corded so as to flush the spotting weft on the upper or cut side of the figures, which, on account of the roughness round the edges, is commonly called the wrong side; yet, as the spotting leaves have the command of one half of the warp only, they can never affect that half which lies in the bottom of the shed; so that the spotting cannot be made to appear to more advantage on the right side of the cloth, than when the figures are woven solid. The case is widely different, however, with the paper spot mountings; for any number of contiguous threads, within the range of the figure, may be raised or sunk, at pleasure. And, therefore, the spotting may be tweeled, brocaded, or flushed on the right side of the cloth, in any manner that may be required, provided it has a sufficient hold of the ground; and hence, the patterns thus flushed are usually denominated japan spots, or brocades; although the plain texture, wherever it is introduced, still retains the name *papering*. Figs. 53, 54, and 55, are examples of this species of spotting.

The example given in Fig. 53 will, however, be sufficient to illustrate the principle on which these patterns are produced; the other two being added merely as varieties of the same draught.

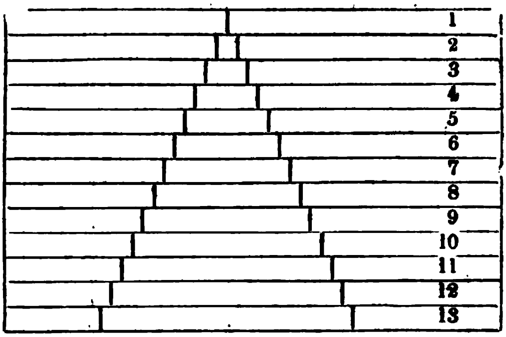
The pattern Fig. 53, requires thirteen leaves, or, if the figures are embosomed, twenty-six, exclusive of those for the ground. The draught is of the diamond form; but, as the odd thread, which is introduced into the centre of paper spots to prevent the teething formerly noticed, is occasionally raised independently of the others, it must have a separate shaft; and, consequently, one leaf more will be requisite in these mountings than in the foregoing example, for spots of the same extent. The draught, therefore, will stand as under; there being no occasion for a plan of cording, as the figure on design paper supplies its place.

No. 56. Fig. 53.



It is necessary to observe, however, that although this arrangement of paper spot mountings be generally adopted by weavers, on account that it places together the leaves of each side of the plain sheds, or divides them into what are termed the back and fore sets; yet it is by no means to be considered the most natural order in which the leaves can be disposed: for if, instead of placing all the odd numbers together for the back set, and putting all the even ones together for the fore set, they had followed the natural or progressive order of the numbers 1, 2, 3, 4, &c. the draught would then have corresponded with the pattern on design paper; and the pattern could also have been read, with more facility, on the parrot, or other machine by which these spots are commonly woven. This will obviously appear, by comparing the preceding draught with the one following, in which this arrangement is observed.

No. 57.



Here the natural order of the leaves is preserved; but another inconveniency arises with respect to the formation of the plain sheds: for it is evident that, as the odd numbers are all raised for one shed, and sunk for the other, the leaves 1 and 13, for example, which are at the two extremities of the draught, will always rise and sink together while weaving the ground, by which the sheds are not only rendered rugged and unevenly, but one part of the warp will be strained considerably more than another. These inconveniences, however, have been obviated of late, by applying a set of plain leaves in front of the spot mounting, after the manner of the draw loom. In such cases, the warp is first drawn into the spot mounting in the usual way, and afterwards through the plain leaves. There is no occasion for the ground leaves in these mountings, except to preserve a uniformity in the plain sheds. The front mounting, formerly, consisted of four leaves of common clasped heddles; and the first thread of the draught was taken below the clasp of a heddle on the back leaf, and above the clasp of a heddle on the leaf next to it; so that these two leaves could produce only the effect of one. The second thread was taken below the clasp of a heddle on the third leaf from the back, and above the clasp of a heddle on the front leaf, which completed one splitful; and the whole draught was only a repetition of this process. Hence, when any portion of the spotting warp was raised to form a shed, that leaf or leaves were also raised which had the warp threads drawn below the clasps of their heddles; so that the spotting sheds could thus be formed without obstruction. But it is now become common to make use of heddles with eyes of a length sufficient to allow the spotting warp to open the sheds, while the spotting leaves remain stationary.

DESIGNING PATTERNS, &c.

It was formerly noticed, that cording plans are unnecessary for these patterns, as they are all woven with machines, which require the figures to be painted on design paper. It is customary, however, to sketch the patterns first on common paper, of the same size that they would stand on the cloth. One of these figures is represented at A, Fig. 53.

It is calculated for a 1400 reed, and to stand on 12½ splits, which are equivalent to thirteen leaves; for every split counts a leaf, and the half split counts one also for the point. This will plainly appear by comparing these remarks with the draught. The reason for introducing the half split, or odd thread, which must always have a place in these draughts, has been already explained.

When the requisite number of leaves for any spot has been determined, this number is counted off on the design paper, taking one space for the centre or point leaf, and the others to the right or left, at pleasure: for one half of the design, including the centre space, is sufficient both for the pattern drawer and weaver, although the spots are commonly made complete, that their effect may be seen to most advantage. When the length of the spot is limited to a given number of shots, which is frequently done by the manufacturer, these are counted upwards on the design, one space for each shot; but if no restriction of this kind be made, the length must be taken in proportion to the breadth of the original; that is, if the figure be just as long as broad, the design paper must be taken square; but if it exceeds or falls short a little of this, a few spaces may be added or deducted accordingly, which, after a little practice, will easily be ascertained by the eye.

When the limits of the pattern, in its enlarged state, are thus determined, the outlines of its several members are again sketched on the design paper, always taking care that they preserve the same proportion to each other as in the original. The outlines are then filled up with a camel hair pencil and paint of one shade, and tweeled or brocaded afterwards with one somewhat darker. See Figs. 53, 54 and 55.

To those, however, who are not much accustomed to hand sketching, the following instructions will be found of some advantage. When the number of leaves has been counted off on one side of the design paper, as from *a* to *e*, at C, Fig. 58, take a pair of compasses and place one point in the middle of the centre space at *a*, and the other in the line at *e*, at the extremity of the number of leaves. Set off this distance from *a* to *e*, or from *a* to *i*, on a piece of common paper B, and draw the line *a*, *b*, for the centre of the spot. Draw another line parallel to this at either extremity of the figure, and this will give the limit of the spot, by the breadth, for the design paper. Take the extent of the figure by the length, which has been ascertained for the design paper, and set it off from *a* to *b*, and draw another line parallel to *ae*, and these will give the boundaries of one half the figure, which is sufficient in the present case. Now, if this and the original be divided into any equal number of squares, whatever part of the spot is in any one square of the small figure, may be easily transferred to a corresponding square of the large sketch; and this process is continued till the sketch be finished. If the sketch be wanted complete, it is only necessary to fold the paper by the centre line *a b;* and then by rubbing it hard with a smooth instrument or with the thumb nail, a mark will be left by the black lead sufficiently strong to show where the reverse side may be traced.

When the sketch has thus been made out on the large scale, it is transferred to the design paper in the following manner: take a piece of common writing paper, on one side of which black lead has been rubbed, and place it on the design paper with the blacked side downward. Then lay the sketch over both, keeping the line *a b* directly over the space allotted for the centre or point leaf, and with a tracer or blunt steel point, trace over the outlines of all the members of the figure, with a moderate pressure, and the black lead will leave a copy on the design paper as exact as the original; after which they may be filled up as formerly directed.

It may be here observed, however, that although the figure A be given for a 1400 reed, it is not necessary to confine it to that sett; for it will equally suit a reed finer or coarser, though in the former case it will be less, and in the latter, larger on the cloth than here represented. In like manner, there is no necessity for confining it to thirteen leaves: for it may be woven in a mounting that has either more or fewer, provided the same proportions be still preserved; but the greater the number of leaves, the more distinct the several parts will be.

Now, in order to read this, or any other pattern of the same kind, on the machine for opening the spotting sheds, it will be observed, that the coupers at A, Fig. 9, Plate 1, are numbered in the same regular order as the leaves in the draught No. 57, though there be only ten given as an example in the drawing; and supposing the spaces on the design paper also to be numbered from *a* to *e*; viz. the centre space *a* to be 1, the second space to the right 2, the third 3; and so on to the outward space at *e*, which would be 13; then, as it is only the light shaded spaces that are to be taken, or the threads which they represent that are to be raised for the spotting sheds, we must take, for the first shed, the leaves 1, 2, and 4, omitting the dark shaded space 3 for the tweel. The coupers, therefore, which are numbered 1, 2 and 4, are connected to the bead cord *a*, above the hole-board; so that when the parrot pulls down this bead, the leaves connected to the coupers 1, 2 and 4, or those marked 1, 2 and 4, in the preceding draught, are raised for this shed. For the second spotting shed, the coupers 1 and 3 are connected to the second bead cord, omitting as before, the dark shaded space 2 for the tweel. In like manner, the third shed has the second leaf only attached to the third bead cord. The fourth bead has the coupers 2, 3, 4 and 5; and the fifth has Nos. 2, 3, 4, 5, and 7; and so forth with the remaining sheds. The same effect would have taken place though the reading had commenced at the centre *a*, and counted towards the left, provided the centre space be always included, as was formerly noticed.

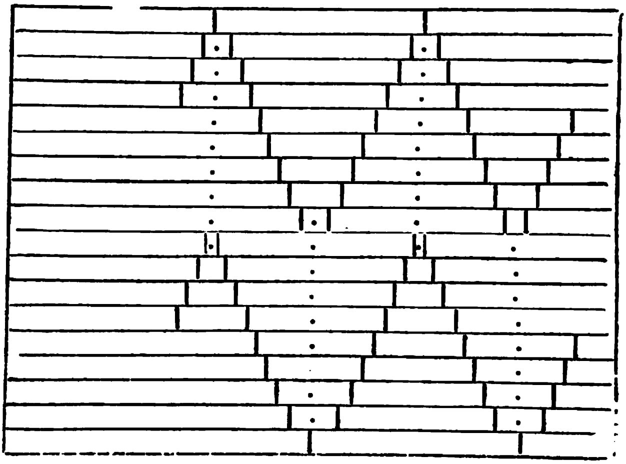
In referring again to Fig. 9, Plate 1, it may be observed, that the two marches immediately below the coupers are employed for weaving the ground, when the mounting wants the plain leaves in front: for all the leaves, or rather the coupers, of the back set are connected to one of these marches, and those of the fore set to the other; so that when they are raised and sunk alternately, by means of long marches connected to the treadles below, plain cloth is produced.

It may be farther added, that a piece of wood F, with teeth cut in it resembling those of a saw, is sometimes employed for shifting the cock or parrot along the beads, instead of the cord *w*. In this case, the motion of the saw never extends beyond the space of one tooth; for, at every time it is drawn back by a weight *t*, a new tooth catches a wire in the parrot, see Fig. 10, and at the next tread, brings it forward to the succeeding bead.

Sometimes these spots are mounted without any top coupers whatever; for the leaves are connected by cords running over pulleys above the loom, to a tail which extends across the shop, similar to that of the draw-loom; the cords of which being numbered, and the lashes applied to the bead cords, in the manner already explained.

In making draughts for paper spot allovers, the same precautions to prevent the teething are necessary, that were mentioned when treating of the detached spot mountings: for, as already noticed, in all figures woven on this principle, every member that extends obliquely towards the left, will be regular, while those that run towards the right will be rugged, unless an odd thread be introduced into the central parts, or where the threads of warp diverge from a point. One example will be sufficient to show the most common form of these draughts. The leaves are separated into sets, as in No. 56, but if a front set of plain leaves be employed for the ground, the arrangement may be changed to that of No. 57.

No. 58.



When spots are woven on tweeled grounds, the paper spot mounting is employed with a set of tweeling heddles in front for the ground, similar to that for the plain ground in No. 57.

FINGER SPOTS OR BROCADES.

This species of ornament was very common on silk grounds while that manufacture flourished in Paisley. It formed also a considerable branch of fancy weaving in the earlier stages of the cotton manufacture; though, at present, it be entirely neglected, probably from the great expense attending the process of weaving.

The mountings for these patterns were the same as those of the common spots; but the spotting was wrought in with the hand, instead of being thrown into the sheds with the shuttle. The spotting employed for silk grounds was soft silk; but for cotton goods, inkle or boss. This last consisted of linen yarn bleached and beat on a smooth stone with a wooden mallet, till it acquired a fine glossy appearance, resembling silk. The spotting was all cut into short pieces, each piece being sufficient for a single spot. The weaver had a boy or girl on the loom along with him as an assistant when the web was narrow, but two when broad; and when a spotting shed was opened, these threads of spotting were taken individually, through their respective lifts with the hand, leaving a fine selvage round the edge of each figure, where, in the common spots, the flushed parts of the spotting were cut away. By this means the brocading was shown to advantage by the common spot mounting, as it now became the right side of the cloth. The figures at 51, plate 9, are adapted to this species of spots.

ROVE SPOTS OR BROCADES.

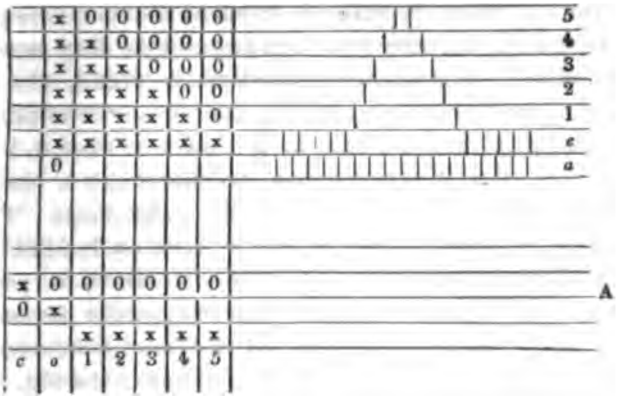
This is another kind of ornament which has lately become common in the cotton manufacture. The spotting employed in these patterns is rove, or loose-twined cotton yarn. The figures are flushed or brocaded as in the preceding case; and when the rove is neatly cut round the edges, they have pretty much the appearance of finger brocades. As it is common, however, to have two threads of warp raised round the edges of these figures to secure the spotting, the paper spot mounting will be found preferable to that of the common spot, for this purpose.

SECT. IV. GAUZE SPOTS.

On the gauze, as a ground, may be woven all that variety of figures or patterns which is produced by the common spot mounting. Like the common spot also, only one thread of a splitful, namely, that which passes through the upper doup, is drawn on the spotting leaves: for as this half of the warp crosses above that of the under doup, it is at liberty to rise in the spotting sheds without any obstruction. Hence, the back leaf through which the upper doup warp of a plain gauze is drawn may be considered as the ground leaf of these spots; for it will contain only those portions of the warp which fall into the intervals between the figures; and, consequently, in allovers and the draw-loom, this leaf is altogether unnecessary. It will farther appear, that as the plain shed of a gauze mounting is formed by raising the upper doup warp, all the shots of spotting will be thrown into portions of this shed, and therefore, whatever shed follows, whether open or cross, the warp will be reversed, or the spotting warp will be sunk; so that one shot of fine or ground weft will be sufficient to bind each shot of spotting, as in the paper spots.

The warp of a gauze spot is drawn through the back leaves from the very same draught, and in the same manner as the common spot, the ground and spotting leaves being made with eyes: and each alternate thread is taken through the upper part, or above the clasp of a heddle on that leaf which contains the under doup warp; which, in this case, may be taken for the fore leaf. The warp, after a new lease has been formed, is again taken through the front mounting, in the same manner as in the plain gauze. As the nature of spot mountings, however, has already been minutely explained, one example will be sufficient to show their application to gauze. It is the same draught as No. 18.

No 59. Figs. 28, 29. Plate 9.



Here the leaves 1, 2, 3, 4, 5, are for the spot, and *e* the ground leaf, which, taken together, contain the upper doup warp; and the leaf *a*, which corresponds with the fore leaf, contains the under doup warp. The leaves at A are for the doups and standards, as represented in the other plans of gauze mountings. The cross treadle *c* is corded as in plain gauze; but the open treadle *o* sinks all the spotting leaves, together with the ground leaf for the open shed. The spotting treadle 1 raises the leaf 5, all the rest of the warp being sunk; but the standard of the upper doups is raised to relieve the spotting warp. The same is to be observed of the other spotting treadles, due regard being had to the number of leaves which they raise.

Since the warp of the upper doups is partly raised and partly sunk in all the spotting sheds, it is evident that those doups which rise will be slack, while the others are kept sufficiently tight by the warp sinking to the bottom of the shed. These slack doups have been found very inconvenient to the weaver, by crossing, or otherwise getting entangled, so as frequently to obstruct the opening of the succeeding sheds. This inconvenience has, however, been obviated some time ago, by applying an additional standard to the upper doups: by which contrivance, while one standard rises to relieve the spotting warp, the other sinks, and keeps all the doups equally stretched. The manner in which this is effected, will be better understood from a drawing than by any description, and therefore a representation of it is given in Plate 6, Fig. 10. F is a leaf of common clasp heddles, which is placed immediately behind the standard of the under doups. The standard B, which is also a leaf of common heddles, is placed behind, and the doup 1 stands between them, passing through below the clasps of both standards in the same direction. The thread of warp is drawn through the double or bow of the doup, where the dot is placed in the Fig.

When both of the standards F and B are sunk, the doups are all kept tight as in the cross shed: when both are raised, the doups are relieved as in the open shed. In all the spotting sheds, however, the leaf B is raised and F is sunk; so that the former permits the spotting warp to rise in opening the spotting sheds, while the latter, by sinking, keeps all the doups down to the bottom of the shed. This additional standard, F, is therefore corded so as to rise in the open shed, and to sink in the cross, and each of the spotting ones. It is further necessary to observe, that there must be two doup weights resting, occasionally, on the long march of the upper doup, one from the short march of each standard.

Although, in weaving gauze spots, one shot of the ground weft be sufficient to bind each preceding shot of spotting, yet patterns are frequently woven with two shots of fine between them, such as Nos. 19, 26, 27, 31, 32, 33, 34 and 42, of Plate 9. These have a pretty good effect when part of the spot is solid, so as the two parts may form a contrast, but when the whole spot is woven in this manner, although it may save a little of the spotting weft, yet the pattern loses much of that richness of texture which is intended for these grounds.

When the spotting leaves of a gauze mounting are numerous, it will be found an improvement to add a full back leaf for the upper doup warp, and raise it with each spotting treadle, which will make the open shed always clear and evenly.

ALLOVERS, ROBES, AND SCARFS.

The nature of allover spots has been fully explained in the first section of this chapter, and their application to gauze grounds will be easy, after the preceding details are well understood. As some of the diaper patterns in chapter 4, however, have lately been woven, with advantage, on gauze grounds for robes and the ends of scarfs, it may be of use to insert one example to show how this is effected.

If therefore the pattern No. 55, Chap. 4, be selected, and put on design paper, according to the instructions there given, it will be found to suit this style of work remarkably well, as it affords a great variety of figure with only four spotting leaves. The draught is here repeated for ease of reference.

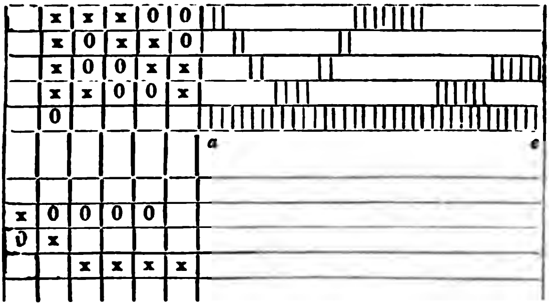
No. 60.

		0	0	1 4 3 1 2 1 3 4 1
0			0	1 1 3 1 1 1 1 3 1 1
0	0			1 1 3 1 1 1 1 3 1 1
	0	0		2 3 1 1 1 1 3 2

a *e*

Here it will be observed, that in the single parts of the draught, there will be only two splits of plain between some of the spotted parts, which spaces are by far too small to admit the scissars for cutting. The draught must therefore be enlarged till the plains be sufficiently wide for this purpose. If the spaces be doubled, that is, by making every 1 in the draught, 2, every 2, 4, every 3, 6, and every 4, 8, then the smallest of the plain spaces will consist of four splits, which will be sufficiently wide for any reed below a 10 or 11 hundred. That part of the draught from *a* to *e*, thus enlarged, with the plan of cording, will stand as under; the ground leaf being unnecessary, as all the upper doup warp is drawn on the spotting leaves.

No. 61.



As these diaper patterns are all adapted to 10 by 10 design paper, they must, when intended for gauze, be reduced to 8 by 12, which is the paper commonly employed for the patterns of this texture: for eight splits of warp ought to form a square with twelve shots of weft, and consequently of the spotting, when the cloth is of a medium thickness. The rule, therefore, for this purpose is very simple; for it is only necessary to observe, that for every two splits on the original design, there must be three spaces taken by the weft on the 8 by 12 to make the objects square: or, in the present example, as every space is to be doubled by the warp on the 8 by 12, so every space must be tripled for the weft, which will exactly preserve the pattern.

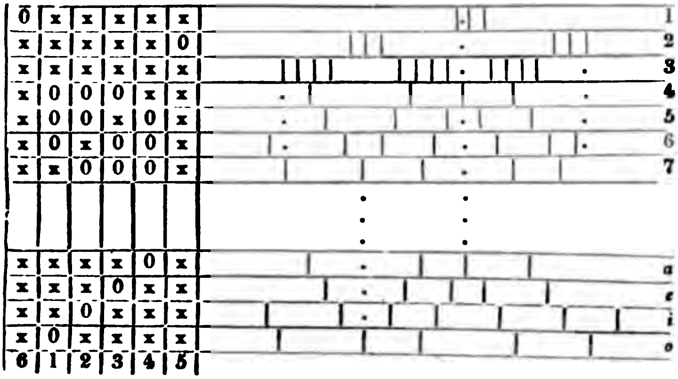
As the bottoms and tops of these patterns, from the great variety of the draught, will always appear broken and unfinished; this will be helped by throwing a few shots of the spotting weft into the plain and cross sheds; the former being opened, in allovers, by raising all the spotting leaves.

In like manner a trimming may be woven by varying the order of treading; and also, spots for the body or filling may be produced by selecting any two of the spotting leaves that may appear most suitable, for one spot, and the other two will produce another figure to embosom it.

TRAFALGARS.

It was formerly observed, that the patterns which have assumed this name, were merely the tweeled gauze turned into a bird-eye or lozenge figure, with a small barleycorn spot in the centre. The following plan will therefore be sufficient to explain the nature of these spots.

No. 62.



0	x	x	x	x	x
x	x	x	x	x	0
x	x	x	x	x	x
x	0	0	0	x	x
x	0	0	x	0	x
x	0	x	0	0	x
x	x	0	0	0	x
x	x	x	x	0	x
x	x	x	0	x	x
x	x	0	x	x	x
x	0	x	x	x	x
6	1	2	3	4	5

If this plan be compared with Fig. 8, Plate 6, the crossing of the warp between the back and front mountings will be easily understood. The leaves 1 and 2 are for the spots, three shots on each, and are drawn opposite the alternate points of the figure, and embosomed. The leaf 3, represents the ground leaf of the common spot, or gauze; and these three leaves contain that half of the warp that would have been drawn through the upper doups, had they been employed. The other half of the warp is drawn on the leaves 4, 5, 6, 7, in the order of the double draught, which was explained under lined work. This part of the warp is again drawn through the doups of the standards *a*, *e*, *i*, *o*, in the very same order: but the other half of the warp is here omitted, as it has no heddles on these leaves.

The treadles numbered 1, 2, 3, 4, are for weaving the ground, as described under tweeled gauze, but the succession of treading is the same as that of the draught on the front leaves. The treadle 5 is for one spot, and 6 is the treadle for the other spot that embosoms it. Here it is to be observed, that when either of the spot leaves is raised for a spotting shed, all the others, both back and front, must be sunk. There is only one shot of weft, as in the common gauze, between the shots of spotting.

SPOTTED NETS.

As the spotting warp, in the common gauze, is taken from that half which passes through the upper doup; so in the whip net, the spotting warp is taken from that portion which passes through the upper bead lam; and therefore the processes of mounting and weaving these two spots are exactly the same, and can require no farther explanation.

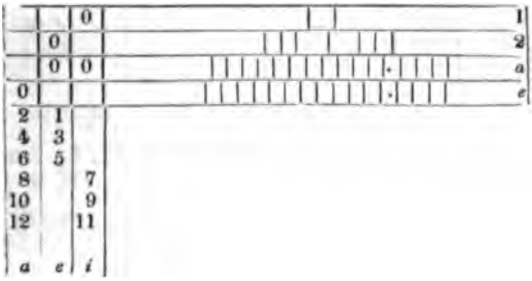
The spotting sheds of the spider and mail nets, however, are generally formed on the gauze part, though it be evident that they may be also raised from the whip. Sometimes these nets are woven in stripes, a few splitfuls of spider net, and a few of the whip net being drawn alternately. In such cases the spot is generally on the gauze spaces, though it would appear, that by spotting the whip parts, the contrast would be more striking.

SECT. V. CUT STRIPES.

In the several varieties of spots which have been hitherto explained, the figures are all formed by throwing the spotting weft into the sheds with the shuttle. In this species of ornament, however, the figures are produced by supernumerary warp, or striping, which is interwoven with the ground at such intervals as form the pattern; and those parts which are not incorporated with the ground, are afterwards cut away, as in the other kinds of spots.

The mounting of a cut stripe consists of a set of plain leaves for the ground, and a set of spotting leaves for the figured parts, which are disposed in the very same manner as those of a common spot: and hence, all the variety of figures which are produced on the latter, as well as some of those adapted to flushed stripes, may be woven on this principle. A few examples, however, will be sufficient to explain this species of fancy weaving. The following plan is adapted to weave the flushed stripe pattern, Fig. 10, Plate 10, as a cut stripe.

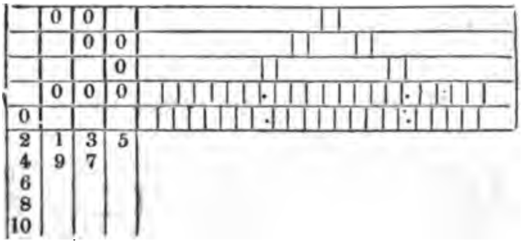
No. 63. Fig. 10. Plate 10.



In this plan, the two leaves *a*, *e*, are for the ground, although, as formerly noticed, it is customary to employ four for this purpose. The leaves 1, 2, are for the spotting warp, which is commonly two threads in the heddle, and one heddleful is taken into the reed along with a splitful of the ground.

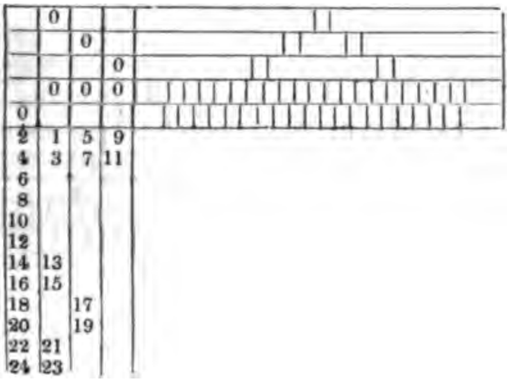
In weaving this pattern, six shots of weft are thrown in with the treadles *a* and *e;* during which time the spotting leaf 2 is raised and sunk alternately, while the leaf 1 is constantly sunk. The leaf 2, therefore, forms the first part of the pattern. The following six shots are thrown in with the treadles *a* and *i;* and this produces the second part of the pattern, the leaf 2 being now constantly sunk; and on this easy principle all the varieties of cut stripes are produced. The following plans will show how to diversify this species of fancy weaving.

No. 64. Fig. 8. Plate 9.

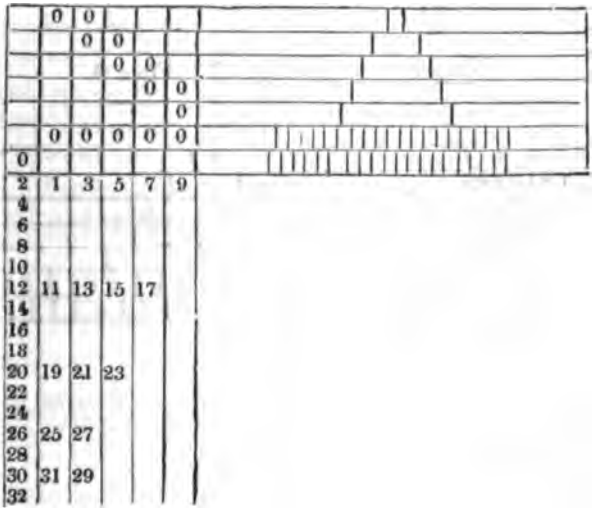


Four shots are thrown in on the treadles 1, 2; four on 3, 2, &c. to make the pattern square.

No. 65. Fig. 9. Plate 9.

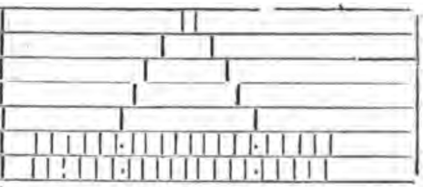


No. 66. Fig. 16. Plate 9.



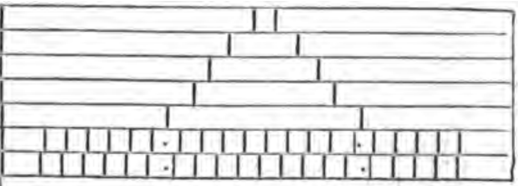
No. 67. Fig. 20. Plate 9.

	0	0	0	0	0		
		0	0	0	0	0	
			0	0	0	0	0
				0	0	0	0
					0	0	
	0	0	0	0	0	0	0
0							
2	1	3	5	7	11	15	17
4				9	13		
6							
8							
10							
12							
14							
16							
18							

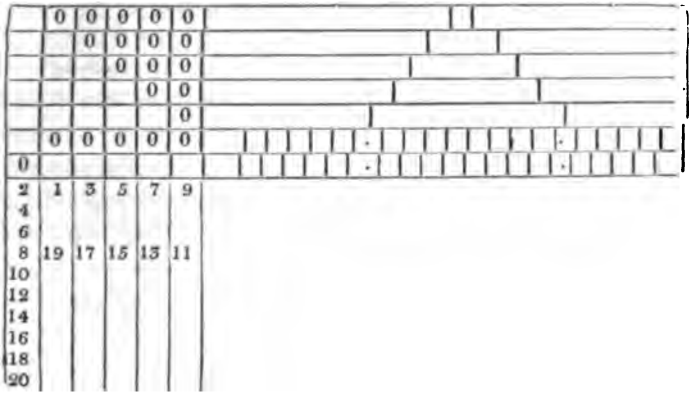


No. 68. Fig. 23. Plate 9.

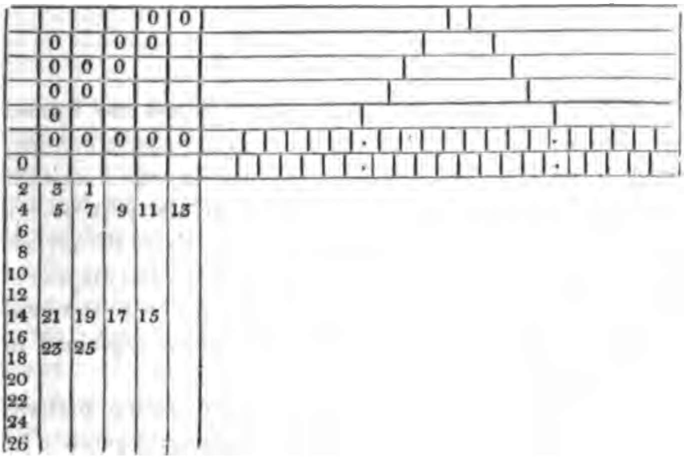
	0			
		0	0	0
		0	0	0
			0	0
				0
	0	0	0	0
0				
2		1	3	5
4				7
6				
8				
10	9			
12	11			
14				13
16				
18		19	17	15
20				



No. 69. Fig. 28. Plate 9.

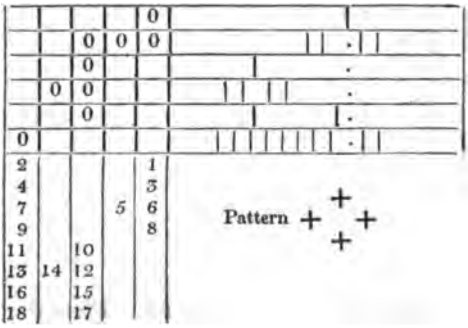


No. 70. Fig. 39. Plate 9.



Sometimes the common spot and cut stripe are combined; and sometimes a single cord or heddleful of the spotting warp is introduced for a stalk or other slender member of the figure. The following, which forms a small cross embosomed, similar to the figure annexed, will serve for an example.

No. 71.



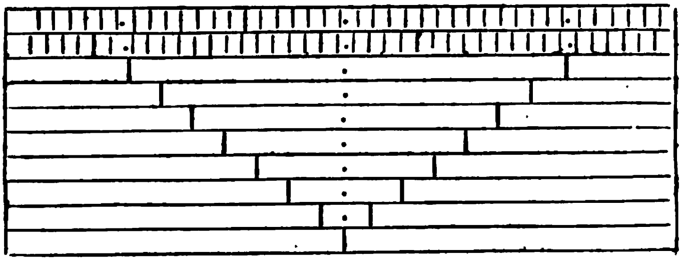
SECT. VI. SEEDING.

In this kind of fancy weaving, the figures are formed likewise by supernumerary warp, or rather coarse cording, made by twisting three ends of single yarn together, which is partially interwoven with the ground; but the patterns are produced by raising these coarse threads above the surface of the cloth, into little naps called seeds, after the manner of counterpanes: which process seems to have been borrowed from the method of weaving the plush velvet, explained in page 134.

The mountings employed for weaving seeding patterns consist of one set of leaves for the ground, and another set for the seeding warp. The leaves for the seeding, which in every respect resemble those of the cut stripe, are, however, usually placed before those of the ground, and so low, that the seeding warp may lie on the race rod when it is not forming a shed. It is customary also, to have two splits of the ground between the seeding cords.

The first six Figs. in Plate 10, are patterns of seeding spots: and as these are all designed for eight leaves, one draught, which is of the diamond form and inserted below, will produce the whole of these varieties; the plans of cording being unnecessary, as they are all woven with a machine like paper spots.

No. 72. Figs. 1, 2, 3, 4, 5, 6. Plate 10.



As there are commonly four threads or two splitfuls of warp between the seeding cords; so there are likewise four shots of weft between the seeding lifts; each of these cords and lifts will therefore be represented by one space on the design paper.

The method of weaving seeding patterns formerly, was, when the first seeding shed was opened, the weaver threw across a shuttle to which a cord, somewhat longer than the breadth of the web, was attached. When this cord was struck up by the reed, it raised the seeding warp above the surface of the cloth, and formed it into naps, as already mentioned. When as many shots of the ground were woven as were sufficient to fasten the seeding, the cord was drawn out and thrown into the following seeding shed. This process, is, however, now superseded by introducing a number of steel wires into the seeding sheds in place of the cords. These wires or needles as they are called, are driven into the edge of a shaft like the needle frame of a lappet, at the distance of about an inch, and are bent at right angles, pointed and polished, with the point of one passing beyond the knee or bend of the other; so that when these wires are shifted horizontally into the seeding shed, no portion of the seeding warp, which is raised, is allowed to escape. One side of the needle is a little flattened at the point where it comes in contact with the knee of the other; so that when the extremities of these two needles are in one part of the seeding shed, the seeds may not be raised higher than the other parts where the wire is single. When the requisite number of shots are thrown into the ground, as in the former process, the weaver draws the shaft to the left side with his thumb, by which the wires are all disengaged, and are again shifted into the next shed.

The seeding warp is usually interwoven with the ground between the seeds, to secure it from being pulled out by accident. This is more particularly the case in running patterns, such as the borders of shawls or colonnades. Spots or detached figures, however, are sometimes fastened only where they begin and end. The process of weaving the seeding warp into the ground is as follows: The seeding shed is first opened, either by the machine or draw-boy, into which the weaver introduces the needles. The seeding warp is then sunk, and two shots of the ground thrown in; the same seeding warp is again raised and a shot of the ground thrown in, then another shot of the ground after it is sunk, which make four shots of ground before the warp be again raised into seeds.

When more than one seeding leaf are requisite for any pattern, it is evident that when one portion of the seeding warp is drawn in to raise the loops or seeds on the cloth, the remaining part would be slacker in proportion to the frequency of its being omitted, were it all beamed on one roll. It is customary, therefore, to have a separate roll for whatever quantity of this warp is drawn on each. Thus, in the examples given above, as these spots require eight spotting leaves, it is usual to divide the warp among eight rolls, with equal quantities on each, except that for the point, which has only one thread for each spot, while the others have two. Sometimes, however, the seeding warp is all beamed on one roll, and a small piece of lead appended to each thread, behind the mounting, to sink the parts which are thus slackened, so as to keep them all equally tight; and these sunk parts are drawn in at the face of the cloth at the end of a piece. This is now the common method in seeding harnesses.

SEEDING SHAWLS.

On this principle, shawls have been woven in great abundance and variety. The most common mountings for these shawls consist of sixteen seeding leaves for the bosom, sixteen for the side borders, and sometimes one or two for guards; the border and bosom draughts being all of the diamond allover form. Hence, as there is only one seeding cord on each point leaf, and two on each of the others, one set of the pattern will occupy thirty spaces of the design paper; and as there are commonly two splitfuls of the ground warp allowed for each space, the whole will be equivalent to sixty splits of the reed; and this is repeated to make up the intended breadth of the border. Thus for example, were the border to stand six inches broad on the cloth; in a 1400 reed, we would find that the pattern must be 3½ times repeated, and 9 cords over, which might be disposed of as guards: for as there are about 38 splits in an inch of a 1400 reed, these multiplied by 6 inches, give 228 splits for the breadth of the border, which divided by 60, quotes 3½ and 18 splits, or 9 cords over; and so of any other breadth or number of leaves.

The patterns best adapted to these shawls are such as have all their sides alike, so that the figures on the cross borders and those on the sides may present similar parts to the centre of the shawl; for were sprigs, such as Figs. 1, 2, &c. Plate 10, to be adopted, the tops of the sprigs on the cross borders would tend to the bosom of the shawl, while those on the side borders would present their sides to it. Sometimes, for sake of variety, a different pattern from that on the borders is put on the corners; and this is read on the leaves of the side borders along with those of the cross heading.

Fig. 7, Plate 10, is a pattern for one of these shawls, adapted to thirty-two leaves; that is, sixteen for the border, and sixteen for the bosom. It is here to be observed, as in the case of paper spots, that the weaver has occasion for no more of the pattern than from one centre to another, both point leaves included; but these patterns are generally drawn full, that their effect may appear to more advantage on the design, before they are woven on the cloth.

As the centres of these shawls are generally filled with figures, which seldom require one-half of the seeding warp which is necessary for the cross borders, a considerable portion of it must be omitted, or dropped as it is termed, during the time of weaving the bosoms. In order, therefore, to save the seeding warp thus omitted, the weaver has a square rod which is fitted to a groove in his slabstock, or that cross bar over which the cloth passes to the receiving roll. When he has woven his cross borders, and as much of the bosom as bring the dropped warp to this groove, he raises the ground and working part of the seeding above the dropped part, into which shed he introduces the square rod, and then presses it down with the dropped warp into the groove, where it is completely secured, after which he cuts it away from the face of the cloth, and lets it remain till he has occasion to use it in the following cross borders. In this case, it is evident, that the dropped part of the warp will require a separate roll from that part which produces the centre figures; and as these figures have generally a considerable piece of the ground plain between them, their portion of the warp will not be wrought up so much as that of the side borders, and consequently, will require another roll for itself.

SEEDING ROBES.

This is another purpose to which seeding has been very extensively applied. Sixteen leaves is also the common mounting for these patterns, and will therefore comprehend the same number of splits of the reed as the preceding mountings. Though limited in their breadth by the smallness of these mountings, seeding robes vary considerably in their depth; some being made only about eight design, as in Fig. 8, Plate 10, which is a pattern for one of these robes, and others from sixteen to eighteen, and some even as high as twenty-six designs; the patterns being nearly as large on a 1400 ground as on the design paper.

Though these patterns have hitherto been considered as woven with leaves, as is frequently the case, yet most weavers prefer them mounted in the manner of a harness, having a small tail running over pulleys, and a simple to which the lashes are attached, as in the paper spot. They are usually woven, also, with a machine, the varieties of which are so numerous, that almost every weaver fits up one to his own mind.

CHAP. IX.

FLUSHING.

THE term flushing is of frequent use in the art of weaving. Any quantity of weft which passes over or under more threads of warp than one, or extends beyond the range of the plain texture, is said to be floated or flushed. Tweels, lined work, and all the varieties of corduroys, &c. are, therefore, merely the effect of flushing, but the term is commonly restricted to a few of the inferior branches of fancy weaving, which are explained in this chapter.

Of flushed patterns, some are produced by additional warp or weft, which is, in general, either coarser, or of a different colour from the ground; and others, merely by floating certain portions of the weft above or below the warp.

SECT. I. DUMB SEEDING, FLUSHED STRIPES. CHECKS AND BORDERS.

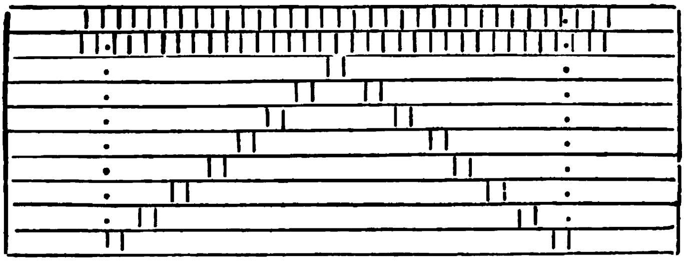
Dumb seeding, or paper flushing, is a species of ornament, in which, like the cut stripes, the patterns are produced, generally on a plain ground, by means of additional warp. In a cut stripe, however, those portions of spotting, or additional warp, which form the figures, are raised and sunk alternately along with the ground sheds; but in dumb seeding, the spotting warp is flushed over three shots of the ground, and is sunk only at the fourth.

In some of these patterns, there are two threads of spotting warp drawn into one heddle, and these are taken into the same interval of the reed with a splitful of the ground. In others, there is a heddle for each spotting thread; in which case, a thread of spotting and a thread of the ground alternately, are taken through the heddles and reed; and sometimes three, and sometimes four of these spotting threads are drawn together on one leaf. When there are two spotting threads in the heddle, the patterns are usually called dumb seeding; and when the warp is drawn in single threads, they are frequently denominated paper flushes, although it is difficult, without very narrow inspection, to discover the difference.

Figs. 1, 2, 3, 4, 5, and 6, Plate 10, may be taken for examples of spots woven on this principle; the draught of which, for two threads in the heddle, is here annexed.

Dumb seed Draught.

No. 1. Figs. 1, 2, 3, &c. Plate 10.

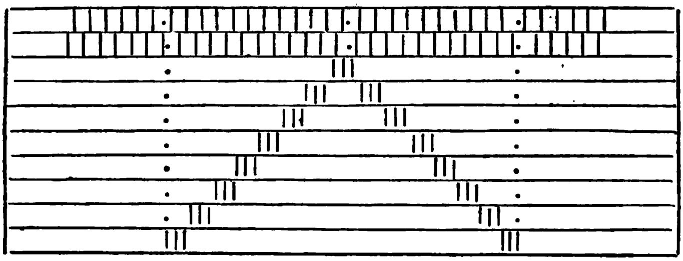


In this example, there are two splits of the flushing warp, or four threads of the ground warp in each of the small members of the spot; and as there are four shots of the ground thrown in on each lift, it follows, that these spots will be composed of a number of small square spaces, four threads each way, very much resembling the figures on the design paper; the small spaces of which representing each four threads.

Again, it will appear that in Fig. 1 there are twenty-one lifts, eighteen of which are different from each other; and, consequently, as each flushing lift requires two treadles, besides two for the ground, the number of treadles necessary for this pattern would be twice 18=36, and the two ground treadles would make 38 in all. But as it would be impracticable to work with so great a number of treadles, the parrot, or some other such machine is always employed for this purpose. The following plan is a draught of these spots woven as a paper flush with three threads rising together, although they are frequently made with four.

Paper Flush Draught.

No. 2. Figs. 1, 2, &c. Plate 10.



When four threads are raised together to form the spot, it is only necessary to take four draughts on the spotting leaves in place of three in the above example. Sometimes this species of flushing is woven in stripes or colonnades; and sometimes it is introduced as guards to veining or purle stripes, which has a very good effect.

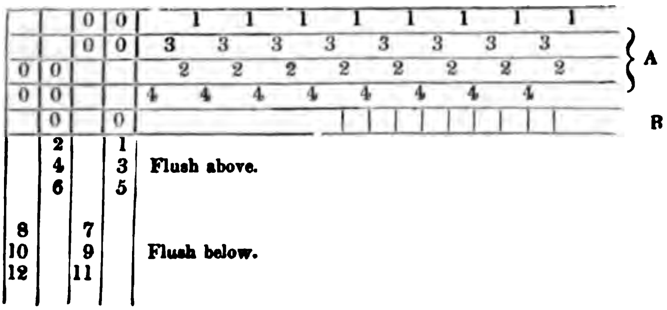
FLUSHED STRIPES.

What are usually termed flushed stripes form their patterns, likewise, by additional warp, and, when they are converted into checks or shawls, additional weft is also requisite. The warp is flushed above and below the ground, alternately, though at greater intervals than in the preceding varieties. The flushing yarn, in like manner, is commonly of a different colour from the ground or body of the web, and frequently silk is introduced for the brilliancy of its colours, especially for the borders of handkerchiefs. Two threads or ends of the flushing warp are usually drawn into each heddle of a flushing leaf, and taken through the same interval of the reed with a splitful of the ground; though some patterns are drawn in single threads, as in the paper flushing.

The most simple patterns of this kind are woven with only one flushing leaf, of which the following plan is an example.

No. 3. Fig. 9. Plate 10.

FLUSH STRIPE.

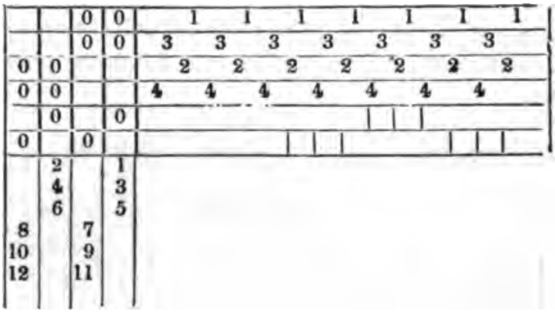


The draught of the ground A, in this example, is exactly the same as in other plain mountings, and the flushing warp is drawn on the front leaf B, one heddleful, of two threads, immediately following each splitful of the ground. The plan is also corded, and the treading marked, so, that the flushing warp is above the ground for six successive shots, and below as many; one splitful of warp and two shots of weft being each represented by a space on the design paper.

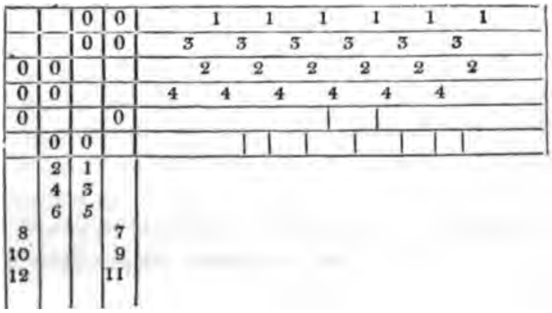
In this, as in the other branches of fancy weaving, variety depends considerably on the extent of the mountings employed; although the economical arrangement of the diaper draughts might be here introduced with great advantage; of which examples will be given farther on. The following plans will exhibit a few more varieties of flushed stripes.

DAMBOARD FLUSH.

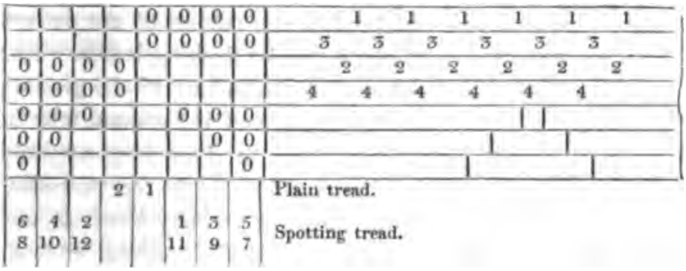
No. 4.



No. 5. Fig. 10.

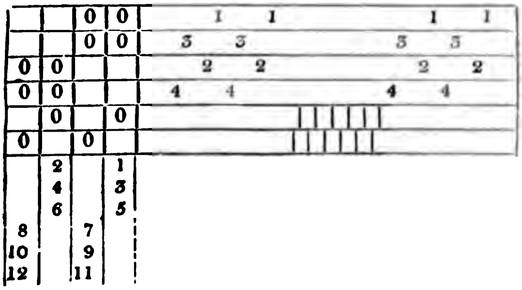


No. 6. Fig. 11.



Double Flush.

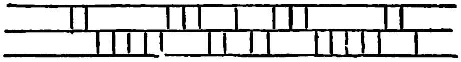
No. 7. Fig. 12.



In this example there are two threads of the flushing warp supposed to be drawn in each heddle, and two of these heddles, one on each leaf, are equivalent to a splitful in the reed. Sometimes, however, these two threads are drawn into separate heddles, as in the paper flushing, which gives the pattern a richer appearance than when they are laid close together. The warps, on these two flushing leaves, are of different colours: and when the one is above, the other is below, as represented by the Fig. in the Plate.

Fig. 13, is a diaper pattern of two divisions, converted into a flushed stripe, which, although one set of the pattern occupies 26 splits, requires only two flushing leaves. The draught on the flushing leaves, independent of the ground, will stand as under; but the draught of the ground may be supplied by adding the plain leaves, and marking a splitful of warp for each heddleful of flushing, as in the preceding examples. The cording is the same as Nos. 4 and 5, and the treading follows the same order as the draught.

No. 8. Fig. 13.

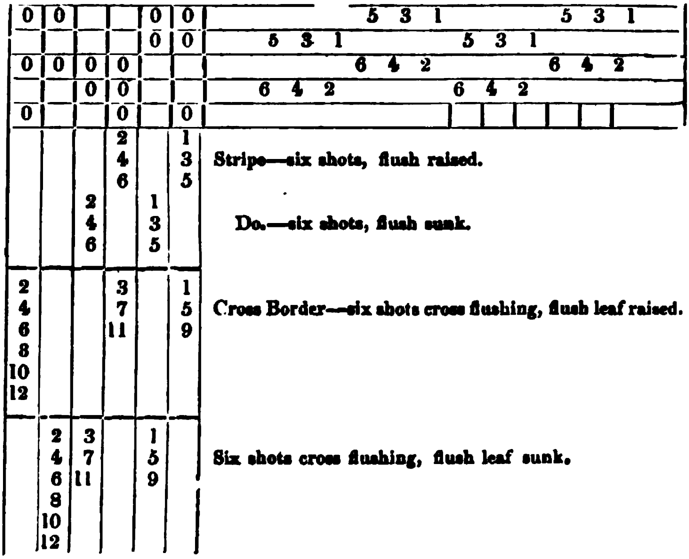


FLUSHED CHECKS OR BORDERS.

When the same figures which are woven in stripes, are to be formed across the body of the web, as in checks and the borders of handkerchiefs, the draught of the ground must correspond with that of the stripe; but double the number of leaves will be necessary to produce the same pattern, on account that both the back and fore threads of a splitful of the warp, or, in other words, both sides of the shed must be sunk when the cross flushing forms the figures above, or raised, when it forms them below. Hence it follows, that raising marks are placed on these plans where the flushing is to appear on the under side of the cloth, but sinking ones where it forms the pattern above. The draught and cording of pattern Fig. 9, adapted to a check or border, will stand as under.

FLUSH CHECK OR BORDER.

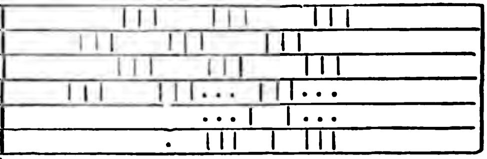
No. 9.


5 3 1 5 3 1
5 3 1 5 3 1
6 4 2 6 4 2
6 4 2 6 4 2
Stripe—six shots, flush raised.
Do.—six shots, flush sunk.
Cross Border—six shots cross flushing, flush leaf raised.
Six shots cross flushing, flush leaf sunk.

In weaving the check, or cross border, a shot of the ground and a shot of the flushing are thrown across alternately; the other changes which take place in working the pattern being particularly pointed out in the plan. The following examples comprehend such varieties as usually occur in this species of weaving.

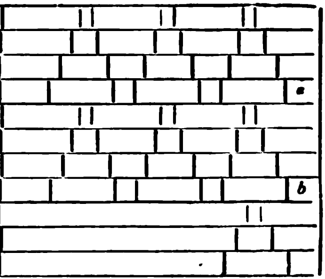
No. 10. Fig. 14.

			0	0	0	
0			0	0		
	0	0			0	
0	0	0				
	0			0	0	
0		0	0			
	8 10 12	2 4 6	1 3 5	7 9 11		Stripe tread.
2 4 6 8 10 12 18 20 26 28 30 32 34 36	15 23	3 7 11 19 27 31 35	1 5 9 17 25 29 33	13 21	14 16 22 24	Cross stripe tread.

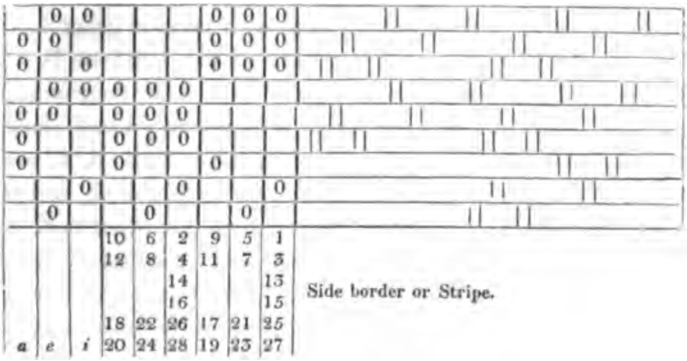


No. 11. Fig. 15.

				0	0	0	0				
				0	0	0	0	0			
				0	0	0	0	0	0		
				0	0	0	0	0	0	0	
0	0	0	0								
0	0	0	0					0			
0	0	0	0					0	0		
0	0	0	0					0	0	0	
0	0	0			0	0	0	0	0	0	
0	0					0	0		0	0	
0							0			0	
6 8	4 10	2 12	14	13	1 11	3 9	5 7				Side spot or stripe.
9 13	5 17	1 21			3 23	7 19	11 15	2 4 22 24	6 8 18 20	10 12 14 16	Check, or cross border.

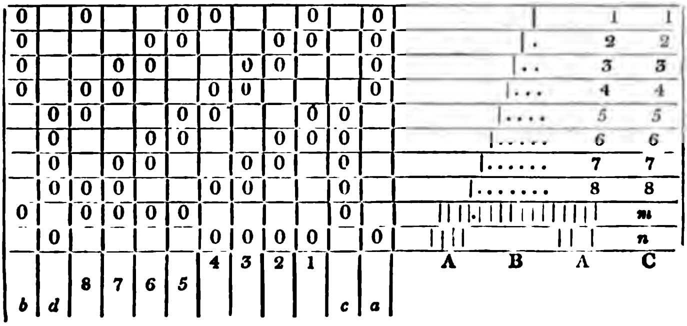


No. 12.



The treadles *a*, *e*, *i*, are for the cross borders, which are wrought alternately with the ground, as in the preceding examples.

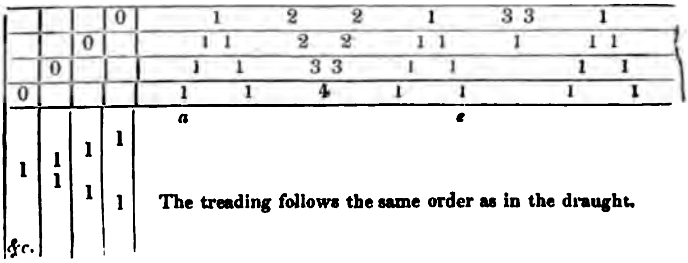
No. 13.



It may be of use to observe, that in No. 11, there is a splitful of plain between the spots, which requires the two additional leaves *a* and *b*, and the two plain shots between the side spots. In No. 12, there are only two splitfuls of flushing warp drawn together on each set of leaves; but the draught may be enlarged at pleasure. No. 13, is an example of single and double flushing on a tweeled ground.—The draught at C, is for the body of the web; at B, i. single flushing, drawn into the reed along with the ground; at A A, is double flushing, which requires no ground along with it. One half of the ground treadles 1, 2, 3, 4, are wrought over so long as the flush leaf *n*, is raised, and *m* sunk; but when these leaves are reversed, the other half, 5, 6, 7, 8, are employed. The other four treadles, *a*, *b*, *c*, *d*, are for the cross flushing: *a* and *b*, are tread alternately, when throwing across the double flushing with the four back leaves raised; *c* and *d*, are employed for the same purpose when they are sunk. The single flushing is thrown in, shot about, with the ground, as already directed.

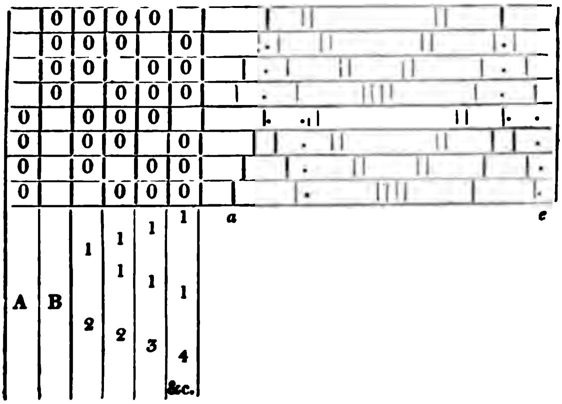
The bottoms or trains of robes are sometimes ornamented with flushing, for which the patterns given under diaper are peculiarly adapted. Let Fig. 6, Plate 4, be taken for an example, the binding plan of which is here inserted, with another showing how such patterns may be adapted to flushing.

No. 14. Fig. 6. Plate 4.



The treading follows the same order as in the draught.

No. 15.



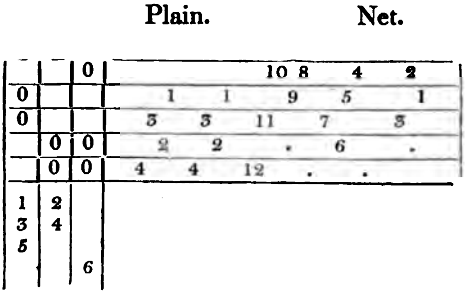
In this example, that part of the draught from *a* to *e*, only, is drawn on No. 15, for want of room. A and B, are the plain, or ground, treadles, the other four being corded for the flushing. The succession in which these flushing treadles is wrought over in weaving the pattern, is the very same as that of the draught, and a shot of the ground is thrown in alternately with a shot of the flushing. In order, however, to give these patterns a sufficiently bold appearance on the cloth, two or three splits may be substituted for each split or draught in No. 14, and drawn on No. 15, accordingly.

SECT. II. FLUSHED NETS, &c.

These nets are woven by flushing, at certain intervals, a few of the warp and weft threads of a plain ground, which is generally a light fabric: by which the threads that lie contiguous to the flushing, are permitted to run together like a cord, during the process of bleaching. These are called flushed nets, to distinguish them from those of cross weaving, and are generally combined with spotting, lappets, and other species of ornamental weaving. The following plan is the draught and cording of the common flush net, woven along with a plain stripe.

COMMON NET.

No. 16. Fig. 16.



In this plan, the flush or net leaf is placed behind, and the other four leaves are merely a set of plain heddles. The dots on the two leaves, toward the front, show where the heddles are set or left empty, when the threads are drawn on the net leaf. Fig. 15, plate 10, shows the effect of this mounting on design paper. Where the small squares are black and white alternately, it is plain cloth; and when the cloth is bleached, the centre thread stands alone, while the others run together like a cord. This takes place both by the warp and weft, which will appear by inspecting the figure.

COMMON NET DAMBOARD.

No. 17.

	0			0		10 8 4 2 A
		0		0	10 8 4 2	B
0					9 5 1	9 5 1
0					11 7 3	11 7 3
	0	0	0	0	. 6 .	. 6 .
	0	0	0	0	12 . .	12 . .
1 3 5	2 4			6	**Stripe tread.**	**Damboard.**
1 3 5		2 4		6	**Alternate stripe.**	
1 3 5			2 4	6	**Check, or Netting across the cloth.** **A, B, Net leaves.**	

ARMENIA NET, AND PLAIN STRIPE.

No. 18. Fig. 17.

				Plain.	Net.
0			0		11 5 A
	0	0			8 2 B
0	0			1 1	9 . 1
0	0			3 3	. 7 3
		0	0	2 2	10 6 .
		0	0	4 4	12 . 4
5	1 3	2	4 6	**A and B the Net leaves.**	

ARMENIA NET, DAMBOARD AND CHECK.

No. 19.

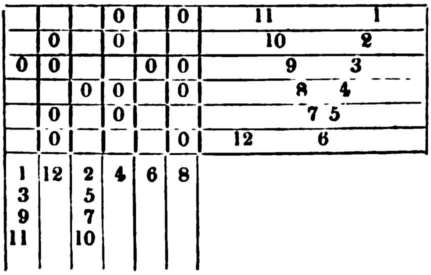
	0		0		0		0		11 5	A
0			0			0	0	11 5		B
0	0	0	0					9 . 1	9 . 1	
0	0	0	0					. 7 3	. 7 3	
				0	0	0	0	10 6 .	10 6 .	
				0	0	0	0	12 . 4	12 . 4	
	0	0		0	0			8 2		C
0		0		0		0			8 2	D
1 3			5	2	4 6			Stripe tread.	Damboard.	
	1 3		5	2		4 6		Alternate Stripe.		
		1 3 5		2			4 6	Check or allover net. A, B, C, D, flushing leaves.		

There is another kind of flushing which forms what are sometimes called diced patterns, and which are woven either on a plain or tweeled ground, but generally on a stout fabric. The three following plans are specimens of flushed ribs.

No. 20. Fig. 18. No. 21. Fig. 19.

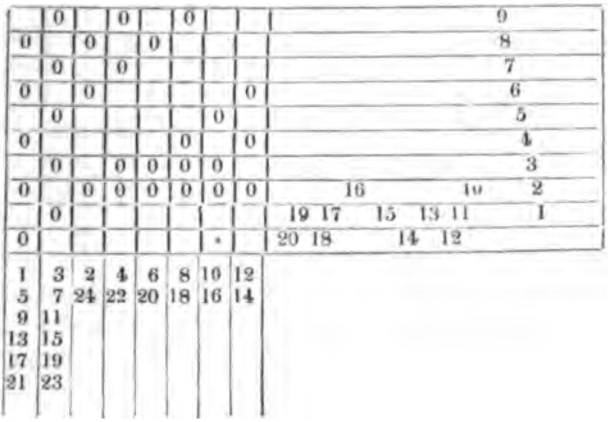
0	0		0	1		0		0	1
0				2		0	0		2
0		0	0	3			0	0	3
	0		0	4	0	0			4
			0	5	0			0	5
	0	0		6	0		0		6
1 3 5	2	4	6		2 4 6	5	3	1	

No. 22.

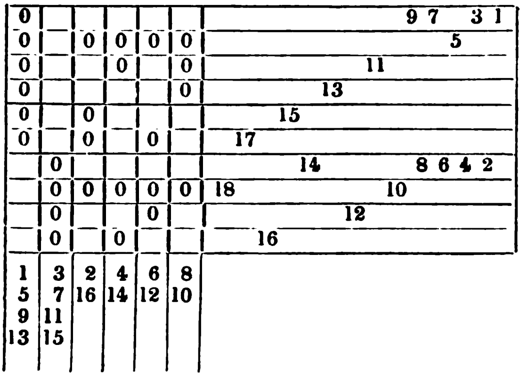


In the four following patterns, a shot of the ground and a shot of the flushing are thrown across alternately.

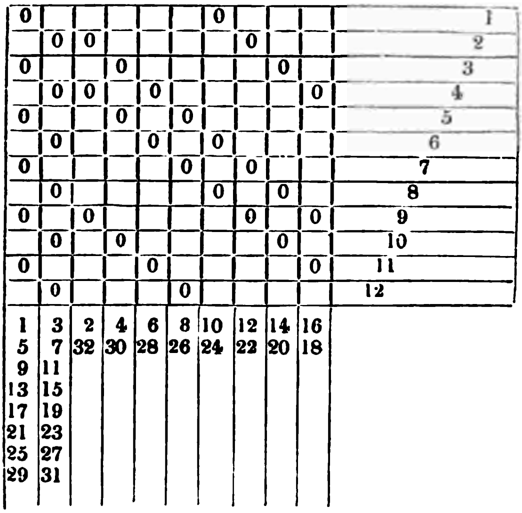
No. 23. Fig. 20.



No. 24. Fig. 21.



No. 25. Fig. 22.



No. 26. Fig. 23.

0						1
	0	0				2
0			0			3
	0	0		0		4
0			0		0	5
	0			0		6
0					0	7
	0					8
1 5 9 13	3 7 11 15	2 16	4 14	6 12	8 10	

Plan of a damboard woven in flats; that is, the one square makes plain cloth, while the other rises and sinks by splitfuls.

No. 27.

0			0		1 1 1
0	0				2 2 2
		0	0		3 3 3
	0	0			4 4 4
0			0	1 1 1	
		0	0	2 2 2	
0	0			3 3 3	
	0	0		4 4 4	
14 16 18 20 22 24	2 4 6 8 10 12	13 15 17 19 21 23	1 3 5 7 9 11		

SECT. III. DUMB FLOWERS.

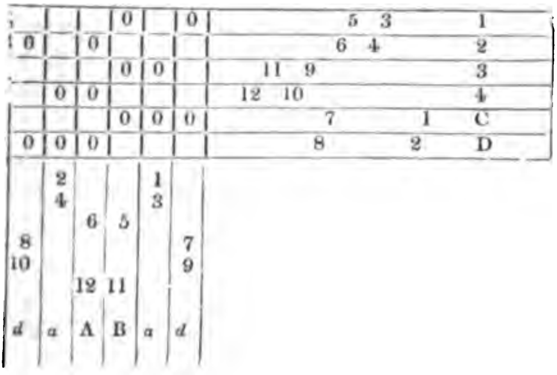
This is another species of flushing, in which the patterns are raised upon the ground by a mounting similar to that of a paper spot. The double or paper spot mounting is preferred to that of the common spot, because both threads of the same splitful are raised and sunk together in the figured parts, in order to throw all the weft of the figures to one side of the cloth; whereas every second thread only could be flushed by the common spot mounting. The spotting sheds of dumb-flowers, are therefore produced by opening the plain sheds of the ground alternately, and sinking the warp of the several members of the pattern as they occur, by which the weft floats above, and forms the pattern.

Dumb-flowers are generally woven on cambric grounds; although they are sometimes applied to the ornamenting of shawls and gown pieces, the warp and weft of which are of different colours. In these goods, the figured parts will display the colour of the warp on one side, and of the weft on the other; and the ground at a little distance, will have the appearance of that shade which arises by blending these two colours together. Thus, for example, if the warp were blue and the weft red, the figures would appear blue on one side and red on the other, and the ground would bear a strong resemblance to purple: And so of other colours.

In some of the dumb-flower patterns, there are intervening plains between the spots, for which two plain or ground leaves are requisite, as in spotting; and in others, the whole of the warp is drawn on the spotting leaves, as in allover patterns. The spotting leaves stand in sets or pairs, on which the warp threads are drawn as for plain cloth; and any set or pair can produce the texture at pleasure. Some weavers place the two leaves of each set together, and others separate them, in which case all the leaves on which the odd threads are drawn, are placed toward the back, and those containing the even numbers in the front, so that these divisions raised alternately, will make plain cloth over the whole web. Examples of each kind are given below.

DUMB-FLOWER BARLEY-CORN SPOT.

No. 28. Fig. 24.



In the above plan the leaves marked 1 and 2 are one set, which work one row of spots, and those marked 3 and 4, the other set, which work the bosom row. C and D are plain leaves which work the split of ground between the embosoming spots. The treadles *a a* work one row of the figures, *d d* the other, and A B the two shots of plain between the rows, agreeably to the pattern on the design paper, in which each space represents two threads.

DIAGONAL SPOT, THREE SETS.

No. 29. Fig. 25.

				0		0	0	3 1
0	0		0					4 2
				0	0		0	7 5
0		0	0					8 6
				0	0	0		11 9
	0	0	0					12 10
10 12	6 8	2 4	A	B	1 3	5 7	9 11	A and B plain readies.

DIAGONAL SPOT, FOUR SETS.

No. 30.

					0		0	0	0	3 1
0	0	0		0						4 2
					0	0		0	0	7 5
0	0		0	0						8 6
					0	0	0		0	11 9
0		0	0	0						12 10
					0	0	0	0		15 13
	0	0	0	0						16 14
14 16	10 12	6 8	2 4	A	B	1 3	5 7	9 11	13 15	

CLUB SPOT.

No. 31.

Fig. 26.

					0	0	0	7 5
0	0	0						8 6
				0		0	0	11 9 3 1
0	0		0					12 10 4 2
				0	0		0	7 5
0		0	0					8 6
				0	0	0		11 9 3 1
	0	0	0					12 10 4 2
		6	2	1	5			
		8	4	3	7			
			10	9				
			12	11				
6	2					1	5	
8	4					3	7	
	10					9		
	12					11		

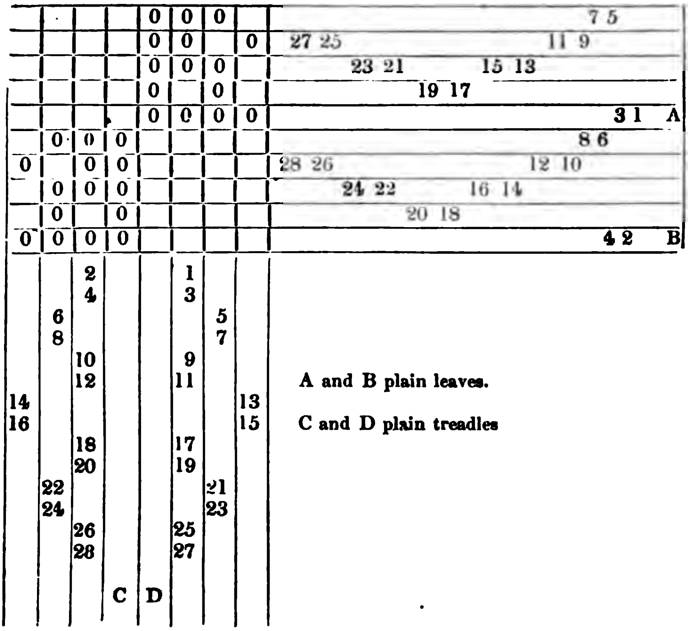
DIAMOND SPOT.

No. 32.

							0	0	0	3 1
					0			0	0	31 29 7 5
					0	0		0		27 25 11 9
					0	0	0			23 21 15 13
						0	0		0	19 17
0	0	0								4 2
0	0			0						32 30 8 6
	0		0	0						28 26 12 10
		0	0	0						24 22 16 14
0		0	0							20 18
		10	6	2	1	5	9			
		12	8	4	3	7	11			
			14	18	17	13				
			16	20	19	15				
26	22			34	33			21	25	
28	24			34	35			23	27	
	30							29		
	32							31		

A CIRCULAR SPOT.

No. 33.



A and B plain leaves.

C and D plain treadles

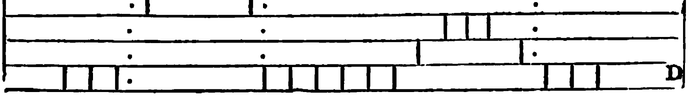
When the warp and weft of a dumb-flower are of different colours, some portions of the warp may be raised contiguous to the flushed parts of the weft, with which it will form a contrast. Thus, if the warp of the mounting No. 32 were white, and the weft black, and the cording arranged as in the following plan, the pattern produced would appear as represented in Fig. 27, in which the nine small squares would exhibit the black weft flushed over the warp, and the white squares, the warp raised above the weft.

No. 34. Fig. 27.

			0			0	0	0	0	
		0			0		0	0	0	
					0	0		0		
0					0	0	0		0	
	0					0	0	0	0	
0	0	0	0			0				
0	0	0		0			0			
	0		0	0						
0		0	0	0					0	
0	0	0	0					0		

The draught and treading of this plan are the same as No. 32. When round spots or other figures which begin and terminate in a point are woven on dumb-flowers, an odd thread is usually introduced into the centre, as in the paper spot mountings. The following plan is the draught and cording of the round spot in Plate 9, Fig. 1, woven as a dumb-flower.

No. 35. Draught. Fig. 1. Plate 9.



No. 35. Cording.

	0	0	0				0						
	0	0	0				0					0	
	0	0	0				0				0	0	
							0			0	0	0	
	0						0			0	0	0	
	0	0					0			0	0	0	
	0	0	0				0			0	0	0	C
				0	0	0							
				0	0	0		0					
						0		0	0				
					0	0		0	0				
				0	0	0		0	0				D
	1 11	3 9	5 7	4 6 8	2 10	A	B	2 10	4 6 8	5 7	3 9	1 11	

A and B plain treadles. C and D the plain leaves

In the preceding plans, No. 28, 29, 30, and 31, have the two leaves of each set placed together, and in the others they are separated, so that the weaver may adopt either of these methods at pleasure.

It is further to be observed of these and other draughts of dumb-flowers in which the several members of the spot are drawn on two splits, that the draughts on each set of leaves may be increased to three, four, or more splitfuls, according to the fineness of the reed, or to the intended size of the figures. Particular care must also be taken in making patterns for dumb-flowers, that the flushed parts do not bear too great a proportion to the plain or ground, otherwise the fabric of the cloth would be enfeebled, not only by the too frequent repetition of the members, but also by giving the flushing a range over too many threads in one place.

The two following plans are adapted to coarse fabrics for towels, &c.

HUCKABACK.

No. 36.

		0	0	5 3 1
	0	0	0	9 7
0	0	0		4 2
0	0			10 8 6
	2		1	
	4		3	
6			5	
8		7		
10		9		

DARLINGTON.

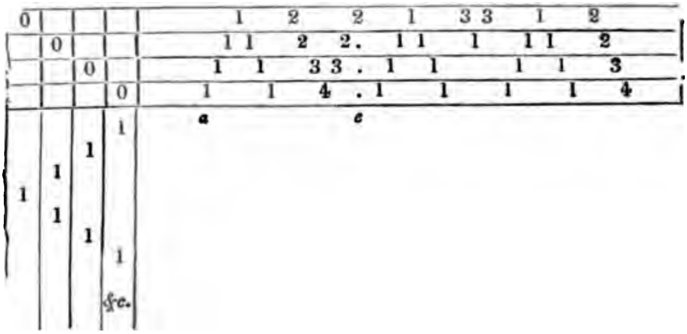
No. 37.

			0	0	0	15 13 11 5 3 1
		0	0	0	0	9 7
0	0	0	0			14 12 4 2
0	0	0				10 8 6
			0	0	0	10 8 6
0			0	0	0	14 12 4 2
0	0	0			0	9 7
0	0	0				15 13 11 5 3 1
	6	2	7	1		
	8	4	9	3		
	10	12		5		
		14		11		
				13		
				15		
7	1			6	2	
9	3			8	4	
	5			10	12	
	11				14	
	13					
	15					

As the diversity of the diaper pattern draughts has been introduced with advantage into several other branches of fancy weaving; so it may be made to afford a very extensive variety in dumb-flowers. It is necessary to observe, however, that the greater proportion of the sets or divisions must be appropriated to the ground or plain parts, and the smaller to the flushing, to prevent the fabric from being too much weakened, as formerly noticed. Thus, were No. 2, Chap. iv. to be selected for a dumb-flower draught, it is evident that the patterns, Figs. 5, 6, 7, 8, Plate 4, are to be preferred to Fig. 9 on this account, though all produced by the same mounting. The following plans will show how Fig. 5 may be woven as a dumb-flower.

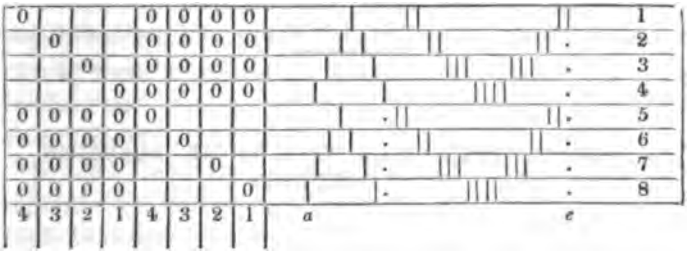
BINDING PLAN.

No. 38.



DUMB-FLOWER PLAN.

No. 39.



The draught in this plan is only that part of the orignal from *a* to *e*, to save room. In working over the treadles, the weaver takes the treadles 1, 1, alternately, which raise the two corresponding leaves 4 and 8 for the flush, while the others rise and sink alternately for the plain ground.—He then changes the treadles, in pairs, in the same order of succession as the draught, as in the other examples of diaper patterns.

CHAP. X.

COMPOUND MOUNTINGS, WITH THEIR DRAUGHTS AND CORDINGS.

It was observed at the commencement of this work, that the fundamental branches of weaving are, the plain texture, tweeling, spotting, double cloth, flushing, and crossed warps. The principles on which these branches are woven, as far as leaves are usually employed, have been investigated in the preceding Chapters. In the course of these investigations, the reader will perceive the facility with which patterns that are considered peculiar to one branch of fancy weaving, may be adapted to another. This has been fully illustrated in the application of diaper patterns to the several branches of double cloth, crapes, spots, &c. in which it will be observed, that this is effected merely by substituting what is termed one set of leaves peculiar to each branch, for one leaf of the binding or original plan. Thus, in the common and gauze spot mountings, the draught is the same as the binding plan, as each spotting leaf may be considered one set: but two leaves are requisite for one set of the paper spot, crape, flushing, and dumb-flowers, respectively; four for double cloth; while one set of tweeling leaves are substituted for each leaf of the binding plan in diaper.

By keeping this observation in view, the manufacturer will find ample scope for improving and diversifying his patterns in any particular branch of weaving; for, to whatever branch his attention may be chiefly directed, he can at all times avail himself of what is new or approved of in the other branches, and appropriate it to his own use.

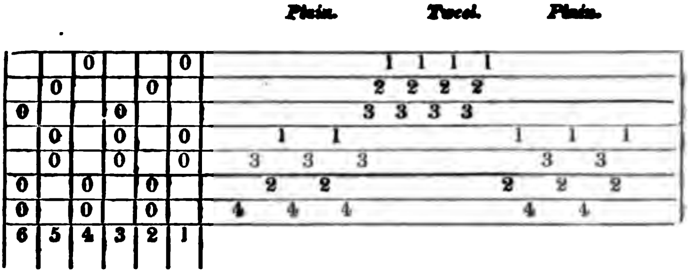
But the great source of variety from which the cloth manufacture has been enriched, and which still continues to supply its demands, is the judicious selection and combination of those single mountings which are employed in the fundamental branches of weaving, and which remain to be explained in this Chapter; and first of

Spaced Draughts. When two or more mountings are requisite for any proposed pattern, a calculation must be made in order to ascertain the number of splits of the reed that will be contained in one set of the draught, the number of times the draught is to be repeated, and also of that portion of the draught which is to be allotted to each mounting. When these have been determined, they are all marked on their respective leaves in the plan of the draught, agreeably to the different kinds of texture or ornament of which the pattern is composed; and the cording of each kind is marked, if necessary, on those treadles which are to open the compound sheds.

The heddles for the coarser kinds of fancy goods, as formerly noticed, are usually knotted on the backing in such a manner that they may be shifted at pleasure, to suit any proposed change of pattern. For the finer kinds of goods, however, the heddles are always spaced on their shafts; that is, the heddles appropriated to each kind of texture or other ornament, are placed on their respective shafts directly opposite to those spaces of the reed through which their warp threads are to pass, leaving blank or vacant spaces for those parts of the pattern which are to be woven by the other mountings.

In order to mark these spaces off on the shafts, so as to correspond with their respective portions of the reed, the heddle-maker takes the number of splits in one set of the pattern from the reed scale in a pair of dividers, and sets it off along a small rod made for this purpose, as often as the pattern is to be repeated, which is commonly specified in the weaver's ticket accompanying the chain. This rod is rounded on one side and flattened on the other, so as to remain steady in the frame below the backing, while the heddles are constructing, and pointing out by the marks of the dividers where they are to be knotted on that cord. Some attention is necessary, however, in taking these divisions from the scale; for a very small error, even though imperceptible at first, will accumulate to something considerable when often repeated. To avoid inconveniences of this kind, it is better to mark off the whole breadth of the heddles on the rod at first, which may be taken either from the reed, or measured off from the scale; and if the number of times the draught is to be repeated can be divided into any number of smaller parts, then divide one of these parts into spaces equal in size to one set of the pattern; after which, these spaces will be easily transferred to the other divisions without any risk of error. If the number of times that the draught is to be repeated should not admit of such division, one or more sets of the pattern may be deducted, by which a number can at all times be found which may be divided into smaller parts. When the divisions for one set of the pattern are thus marked off, they must be again subdivided into those spaces which are to be occupied by the different mountings; and the spaces for each leaf are either marked on a separate rod, or on different parts of the same rod, when the pattern is not too complex. To exemplify these remarks, we shall take the draught of a three leafed tweel stripe woven along with a plain ground.

No. 1.



This draught will be found to contain ten splitfuls of plain, and six of tweeling warp, which taken together, make sixteen splits in one set of the pattern, or as it is commonly termed, once over the draught. Suppose this web were to be woven in a 1200 reed and yard broad; and that two porters or 40 splits additional were allowed to uphold this breadth, making in all 1240 splits; then divide this number by 16, the number of splits in one set of the draught, and the quotient will show how often the pattern is to be repeated. Thus,

16)1240(77
112
———
120
112
———
8 splits over.

Now we find that the draught is to be 77 times repeated, to make up the breadth of the web, and 8 splits over, to which a few splits more may be added for selvages, less or more, as the manufacturer may find necessary.

Were the heddles of this mounting to be spaced, it would be obvious, that by taking 16 splits from the scale for a 1200 reed in a pair of compasses, and setting this space off 77 times along the rod above mentioned, the marks would show where each set of the draught should be placed on the leaves, to make it correspond with the reed. Or, if the whole breadth of the web were first marked off on the rod; then, as the number 77 is composed of the numbers 7 and 11, viz. 7 × 11=77, the whole breadth may be divided either into 7 or 11 parts, and each of these again, subdivided into spaces equal to one set of the pattern, which would prevent any error which might take place by the frequent repetition of the smaller divisions.

Again, by dividing each of these small spaces in the proportion of 10 to 6, leaving 5 splits at each side, that the half of a plain may be left between the stripes and selvages, the respective positions of the plain and tweeled stripes will be truly ascertained. It is not customary, however, to space such simple mountings as this example, especially for the plain parts, as a full set of plain heddles is commonly employed, and those heddles opposite the tweeled parts are left empty.

If the tweeled stripes were made of coarser warp than the plain, with two threads in each heddle, and two heddles to a split; then, to find the number of porters or beers of each kind of warp, supposing two threads to the split of plain, we multiply the number of times which the draught is repeated, viz. 77, by the number of splits in each plain, viz. 10, and the product gives the number of splits of plain or fine warp; but to this the allowance for selvages must be added. Thus 77 × 10=770 splits, or 38½ porters, exclusive of the selvages. Again, as there are six splits in the tweeled stripe with four threads, or two ordinary splits in each, it will be 77 × 12=924, or 46 porters and 4 splits for the coarse portion of the warp; and so of any other of the same kind.

Tweeled and Plain Textures.—For patterns of this kind, the mountings, as will appear by the preceding example, will consist of one set of plain, and one set of tweeling leaves, and the raising and sinking cords of the plain mounting are tied alternately on the tweeling treadles. It must be observed, however, that in all mountings which have an odd number of tweeling leaves, double the number of treadles are requisite, in order to make the plain sheds alternate without interruption. Thus, in the foregoing example, which is the plan of a three leafed tweel stripe, it will be found that the first and third treadles would raise the same plain leaf; as will also be the case with the first and last treadle of every odd leafed tweel; consequently, these treadles cannot follow each other without interrupting the order of the plain sheds; and, therefore, the number of treadles must be doubled to maintain this order. All tweel stripes, however, which have an even number of tweeling leaves, are woven with one set of tweeling treadles, as the sheds of the plain parts can then be made alternate without any interruption. The following examples will sufficiently illustrate these remarks.

No. 2.

A FOUR LEAFED REGULAR TWEEL AND PLAIN STRIPE.

			0												1				1				1				1								
	0													2				2				2				2									
		0											3				3				3				3										
0												4				4				4				4											
		0	0				1				1																				1				1
		0	0		3				3																				3				3		
0	0					2				2																				2				2	
0	0			4				4																				4				4			
4	2	3	1	*Plain.*								*Tweel.*																*Plain.*							

No. 3.

A SATINET TWEEL AND PLAIN STRIPE.

			0												1				1				1				1								
		0												2				2				2				2									
	0												3				3				3				3										
0												4				4				4				4											
		0	0				1				1																				1				1
		0	0		3				3																				3				3		
0	0					2				2																				2				2	
0	0			4				4																				4				4			
4	2	3	1	*Plain.*								*Tweel.*																*Plain.*							

No. 4.

A FIVE LEAFED REGULAR TWEEL AND PLAIN STRIPE.

		0							0					1					1					1								
				0		0							2					2					2									
	0							0				3					3					3										
			0		0						4					4					4											
0							0			5					5					5												
					0	0	0	0	0																			1				1
					0	0	0	0	0																	3				3		
0	0	0	0	0																							2				2	
0	0	0	0	0																					4				4			
10	8	6	4	2	9	7	5	3	1	*Tweel.*															*Plain.*							

No. 5.

A FIVE LEAFED SATIN TWEEL AND PLAIN STRIPE.

		0							0					1					1					1								
	0							0					2					2					2									
0							0					3					3					3										
				0		0					4					4					4											
			0		0					5					5					5												
					0	0	0	0	0																		1				1
					0	0	0	0	0																3				3			
0	0	0	0	0																						2				2		
0	0	0	0	0																				4				4				
10	8	6	4	2	9	7	5	3	1							*Tweel.*										*Plain.*						

In the following plan of a four leafed tweel stripe, each tweeling leaf is raised twice in succession, in order to lengthen out the flushing, which renders eight leaves necessary to raise the plain leaves alternately.

No. 6.

LONG TWEEL.

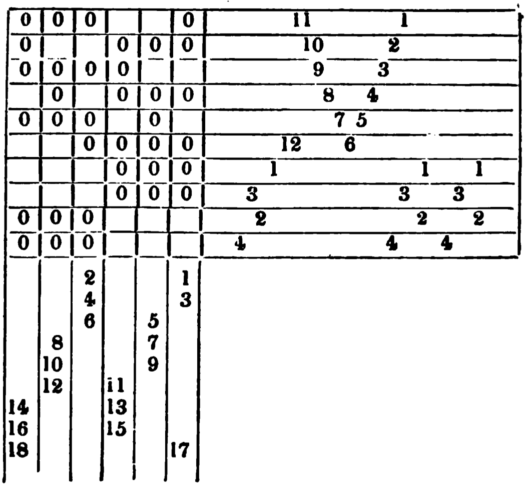
			0				0				1				1				1								
		0				0				2				2				2									
	0				0				3				3				3										
0				0				4				4				4											
				0	0	0	0																1				1
				0	0	0	0														3				3		
0	0	0	0																			2				2	
0	0	0	0																	4				4			
8	6	4	2	7	5	3	1						*Tweel.*										*Plain.*				

In all these examples, the greater portion of the tweeling leaves are sunk, and therefore, the weft will appear to most advantage on the upper side of the cloth while in the loom. This method is generally adopted when the pattern will permit, as the weaver finds it most advantageous to raise the smaller, and sink the greater portion of leaves.

Sometimes the draught of a tweeled stripe is made in the diamond form, and the pattern produced is commonly called a dart stripe, or herring bone. The following plans are examples of these stripes.

No. 7.

DART STRIPE.



0	0	0			0	11 1
0			0	0	0	10 2
0	0	0	0			9 3
	0		0	0	0	8 4
0	0	0		0		7 5
		0	0	0	0	12 6
			0	0	0	1 1 1
			0	0	0	3 3 3
0	0	0				2 2 2
0	0	0				4 4 4

		2			1
		4			3
		6		5	
	8			7	
	10			9	
	12		11		
14			13		
16			15		
18					17

No. 8.

DART STRIPE.

0			0	0	0	0	0	17 9 1
0	0	0	0			0	0	16 2
		0	0	0	0	0	0	15 3
0	0	0	0		0	0		14 4
	0	0		0	0	0	0	13 5
0	0	0	0	0	0			12 6
0	0			0	0	0	0	11 7
0	0	0	0	0			0	10 8
				0	0	0	0	1 1 1
				0	0	0	0	3 3 3
0	0	0	0					2 2 2
0	0	0	0					4 4 4
			2				1	
			4				3	
			6			5		
		8				7		
		10				9		
		12			11			
	14				13			
	16				15			
	18			17				
20				19				
22				21				
24							23	

No. 9.

A HERRING BONE STRIPE. Fig. 27. Plate 1.

0			0	8 4 9 5 1
	0		0	7 3 10 6 2
	0	0		10 6 2 7 3
0		0		9 5 1 8 4
		0	0	1 1 1
		0	0	3 3 3
0	0			2 2 2
0	0			4 4 4
4	2	3	1	

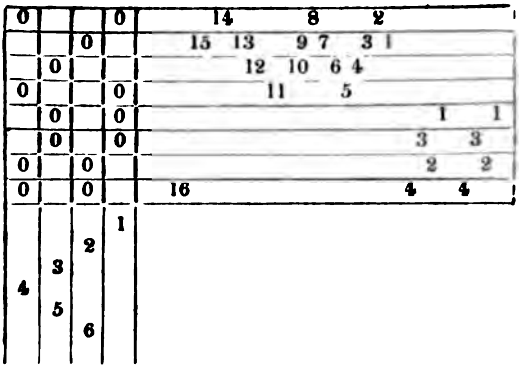
In Nos. 7 and 8, the tweeled warp is thrown to the upper side of the cloth, and the flushing is lengthened by continuing the treading on each pair of treadles, to six shots.

In No. 7, there are twelve draughts in the dart stripe, which, supposing two threads in each heddle, and two heddles to make a splitful, would fill six intervals of the reed. But as the dart forms a point at the sixth draught, where there is only one thread on that leaf, the stripe would be complete with only eleven heddlefuls. This, however, would leave only one heddleful for the last split of the stripe, which would have been taken into the reed along with the first thread of the following plain, if the twelfth thread had not been taken into a heddle on the fore leaf at 12. This method of disposing of the twelfth thread, to make complete splitfuls of tweeling warp, occasions no other injury to the figure, than that one barb of the dart is a little longer than the other. In No. 8, the odd thread is introduced at the point where the threads 8, 9, 10, are taken through one interval of the reed. Each of these methods is occasionally adopted, as the manufacturer may suppose best to suit his purpose. It may be further remarked, that when stripes are wanted broader than these examples, it is only necessary to repeat the draughts on each side of the point as often as is necessary to make the requisite breadth.

Bird-eye patterns, such as those explained in Chapter III. may also be woven in stripes along with plain or other textures. The following are examples:—

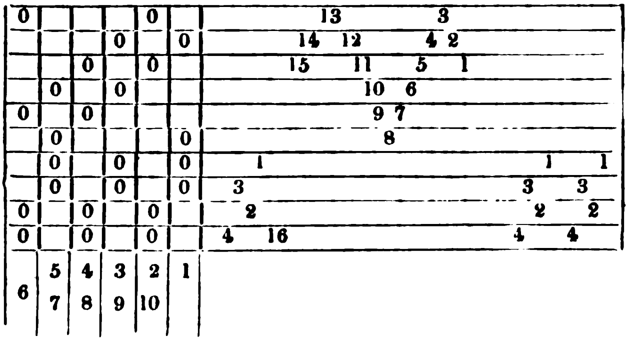
No. 10.

BIRD-EYE STRIPE.



No. 11.

BIRD-EYE STRIPE.



In these two draughts, the threads marked 16 of the plain stripe, are taken into the same intervals of the reed along with 15, in their respective mountings.

When the web is to be tweeled across, in order to form checks or the borders of handkerchiefs, the same number of leaves must be employed for the ground that are requisite for the tweeled stripe. Thus, to convert a four leafed tweel stripe into a check, the common plain mounting of four leaves, will produce a similar tweel across the web. But should the stripe be woven in a six or eight leafed tweel mounting, the plain parts must also be drawn on six or eight leaves, and each leaf is corded so as to rise and sink alternately in the plain parts, but to produce the tweel in the check. Hence it will appear, that a stripe with an odd number of tweeling leaves will not admit of a similar tweel for the crossing or check, as the ground leaves must always be divided into equal portions in weaving the plain parts.

No. 12.

A FOUR LEAFED TWEEL CHECK.

		0	0			0	0		1 1 1 1
	0	0			0	0			2 2 2 2
0	0			0	0				3 3 3 3
0			0	0			0		4 4 4 4
		0	0		0		0	1 1 1 1	
	0	0		0		0		2 2 2 2	
0	0				0		0	3 3 3 3	
0			0	0		0		4 4 4 4	
4	3	2	1	4	3	2	1	*Plain.*	*Tweel.*
	Check.				*Stripe.*				

In this example the tweeling is alike on both sides of the cloth; but in those that follow, the warp of the tweeled stripe and weft of the check or cross border, appear on the under side of the cloth while in the loom.

No. 13.

FOUR LEAFED REGULAR TWEEL CHECK.

0	0	0					0		1 1 1
0	0		0			0			2 2 2
0		0	0		0				3 3 3
	0	0	0	0					4 4 4
0	0	0			0		0	1 1 1	
0	0		0	0		0		2 2 2	
0		0	0		0		0	3 3 3	
	0	0	0	0		0		4 4 4	
4	3	2	1	4	3	2	1	*Plain.*	*Tweel.*

Check. *Stripe.*

No. 14.

SIX LEAFED SATIN TWEEL CHECK.

0	0	0	0	0							0		1 1
0	0		0	0	0			0					2 2
0	0	0	0		0					0			3 3
0		0	0	0	0		0						4 4
0	0	0		0	0				0				5 5
	0	0	0	0	0	0							6 6
0	0	0	0	0			0		0		0	1 1	
0	0		0	0	0	0		0		0		2 2	
0	0	0	0		0		0		0		0	3 3	
0		0	0	0	0	0		0		0		4 4	
0	0	0		0	0		0		0		0	5 5	
	0	0	0	0	0	0		0		0		6 6	
6	5	4	3	2	1	6	5	4	3	2	1	*Plain.*	*Tweel.*

Check. *Stripe.*

No. 15.

EIGHT LEAFED SATIN TWEEL CHECK.

0	0	0	0	0	0	0									0		1
0	0	0	0		0	0	0					0					2
0		0	0	0	0	0	0		0								3
0	0	0	0	0	0		0							0			4
0	0	0		0	0	0	0				0						5
	0	0	0	0	0	0	0	0									6
0	0	0	0	0		0	0						0				7
0	0		0	0	0	0	0			0							8
0	0	0	0	0	0	0			0		0		0		0	1	
0	0	0	0		0	0	0	0		0		0		0		2	
0		0	0	0	0	0	0		0		0		0		0	3	
0	0	0	0	0	0		0	0		0		0		0		4	
0	0	0		0	0	0	0		0		0		0		0	5	
	0	0	0	0	0	0	0	0		0		0		0		6	
0	0	0	0	0		0	0		0		0		0		0	7	
0	0		0	0	0	0	0	0		0		0		0		8	
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	*Plain.*	*Tweel.*
			Check.									*Stripe.*					

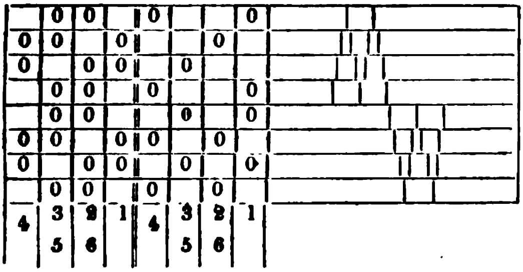
In Nos. 13, 14, and 15, the treadles of the stripe raise and sink the plain leaves alternately, and each treadle raises one leaf of the tweel, leaving the greater proportion of the warp below: but the check treadles raise all the leaves but one, both in the plain and tweel; and consequently, the check weft will also be thrown to the under side of the cloth, so as to correspond with the warp.

From these examples it will obviously appear, that any tweel of an even number of leaves may be converted into stripes and checks; and if the stripe be formed into a dart or herring bone, the plain may be woven by a single over and over draught, and converted into a check the same as the stripe, by working over the treadles in one direction for half of the cross stripe, and reversing the order of treading for the other.

Bird-eye patterns may also be woven in checks after the same manner; one example of which is subjoined.

No. 16.

BIRD-EYE CHECK.



COMBINATIONS OF GAUZE, &c.

Gauze, veining, purles, spidering, &c. are also variously combined with several of the other branches of fancy weaving, and produce some of the most beautiful and delicate patterns in the silk and cotton manufactures. But as it is not customary to accompany these compound draughts with a plan of cording, on account of the difficulty of representing the mountings of crossed warps on paper, one example will be sufficient to show how this may be effected.

Fig. 11. Plate 6, is the plan of a mounting for weaving plain gauze, plain texture, and veining, in stripes; consequently, three distinct mountings are requisite. The treadle marked 1 opens the cross shed of the vein and one of the sheds of the plain mounting, but sinks the whole of the plain gauze warp. Treadle 2 opens the cross sheds of

both vein and gauze, and reverses the shed of the plain mounting. Treadle 3 produces the open sheds of both gauze and vein mountings, and the same plain shed as treadle 1; and the treadle 4 produces the open shed of the vein, and the same plain shed as treadle 2, but sinks the whole of the gauze warp. The order of working over the treadles, therefore, will be 1, 2, 1; 4, 3, 4. The weft which is flushed over the plain gauze is afterwards cut away, as in spotting.

It must be observed, however, that when gauze and plain are woven in alternate stripes, those parts of the reed which are occupied by the plains will be full; but in the gauze spaces, a splitfúl of the warp passes through every second interval only; consequently, the set of reed in the former, will, in general, be double of that in the latter. And hence, when additional weft is thrown in, as in the above example, the plain texture will make a prètty bold contrast to the light transparent fabric of the gauze.

Other proportions, however, have been assumed between the gauze and plain grounds, so as to combine a finer sett of the former with a coarser sett of the latter. Thus, a 1200 gauze woven with an 1800 cambric or jaconet, has been considered a very good proportion; the fine gauze setting off the plain ground to more advantage than when it is only half of the sett of reed. In webs of this description, the reed must be spaced to the pattern, the warp of both gauze and plain being suited to their respective fabrics: and the greater proportion of weft which is necessary for the 1200 reed, renders only one shot of plain requisite between the shots of gauze.

When cambric and gauze are woven in alternate squares, or checker patterns, two sets of gauze and two of plain heddles are necessary; and when greater variety is required, additional sets of each must be added, as in the other branches of fancy weaving. When the number of gauze sets, however, exceed two, they are, in general, curtailed, by omitting the upper doup and standard, in the manner formerly explained.

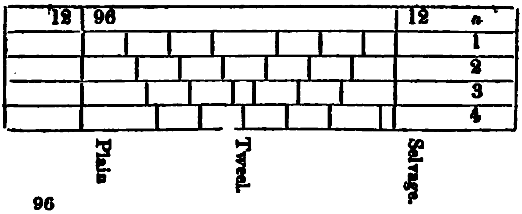
As the warp of gauze, when converted into plain texture, produces but a very thin or flimsy fabric, it is necessary to introduce additional warp as well as weft into those parts which are woven plain, which, one being flushed above, and the other below, the gauze spaces, are afterwards cut away. A splitful of this additional warp is taken into the reed alternately with a splitful of the gauze; so that the former, as noticed above, is exactly double the set of the latter.

This method of forming patterns with gauze and cambric, like some of the other branches of fancy weaving, may be extended to all the varieties of a diaper mounting: for any draught of the latter may be adapted to the former, merely by substituting one set of gauze, and one of plain leaves, for each set of the tweel, and varying the succession of the draught and treading accordingly.

It is not customary, as was already observed, for the manufacturer to annex the plans of cording to these compound draughts; neither is it always necessary, particularly in extensive business, to represent in the draught every leaf which is requisite in the mounting. All that is commonly required in the draught is, to point out to the heddle-maker, the quantity and arrangement of each kind of warp in one set of the pattern, with the number of times the pattern is to be repeated; and to the weaver, the order of succession in which these several warps are to be drawn into their respective mountings; each being supposed to understand his own department. The following examples will illustrate these remarks.

No. 17.

A 1200 $\frac{5}{4}$ TWEEL STRIPE LAPPET.



96
12
108

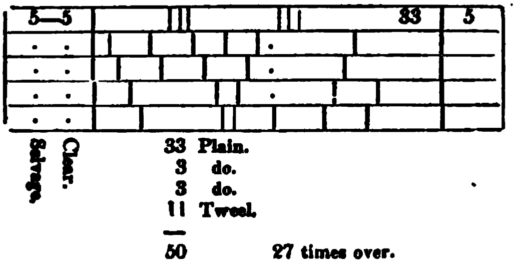
14 times over.

Here the leaf *a* represents the plain mounting; but it is necessary to draw all the four leaves of the tweel, to show the variety in the draught. There are 12 splits of selvage on each side, which are 12 splits of the reed; but as there are usually a few splits single, or clear of the selvage, which suppose to be 5, there will 7 neat remain for the selvage, which must be double, that is, two threads in the heddle, and two heddles to the split, so that 7 additional splitfuls of warp must be allowed on each side for this purpose.

Again, there are 96 splits plain on which the lappet is woven, and 12 splits in the tweel stripe, which make 108 splits in one set of the pattern, or once over the draught. This multiplied by 14, the number of times the draught is repeated, gives 1512 for the neat warp. To this must be added 24 for the two selvages, together with 14 for the seven twists or double warp on each side; so that the whole warp in the web will be 1550 splits. But when the tweeled stripe has two threads in the heddle, and two heddles to the split, which is commonly the case, the striping warp must be doubled. Another example of the same kind.

No. 18.

A 1100 $\frac{5}{4}$ TWEEL STRIPE LAPPET.

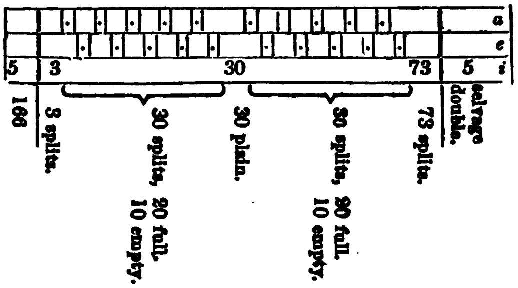


Here there are 5 splits double for selvages on each side, and 5 clear between the tweel and selvage on the left. This calculated as in the preceding example will give 1370 for the warp, including the selvages. It may be farther observed, that each mark on the leaf representing the plain mounting denotes one splitful of warp, while those on the tweeling leaves are only single threads.

When gauze, veins, &c. are introduced into a pattern, one leaf will also represent a set of each kind; and these mountings will be sufficiently distinguished from the plain ones, by placing dots where the empty intervals of the reed occur, as in the following examples:—

No. 19.

A 1200 $\frac{5}{4}$ PURLE STRIPE.



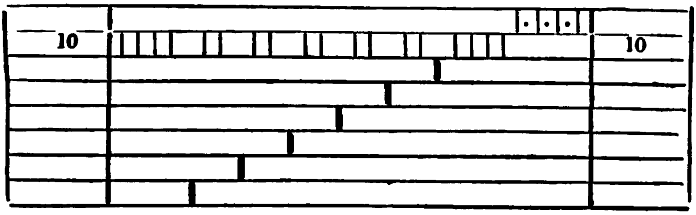
a and *e* are the two sets of gauze mounting for the purle, and *i* the set for the plain.

In this example there are 166 splits of the reed in one set of the pattern. Now suppose 1500 splits of warp, or rather 1500 splits to be counted of the reed; then 1500 divided by 166, gives 9 times over the draught, and 6 remaining, to which add 4, makes 10 for the selvages. Now to ascertain the quantity of warp of each kind, we have 73 for one stripe of plain, 30 for another, and 3 for the third, which added together make 106. These multiplied by 9, the number of times the draught is repeated, gives 954, to which add 20 for the two selvages, four threads being a splitful, and the sum will be 974, or 48 porters and 14 splits, for the whole of the plain warp.

Again, there are 40 full splits of the purle, 20 in each stripe, which multiplied by 9, gives 360 splits, or 18 porters of gauze warp, making in all 66 porters and 14 splits. After the same manner may the warp of the following draughts be calculated.

No. 20.

A 1300 $\frac{4}{5}$ VEINED SEED.

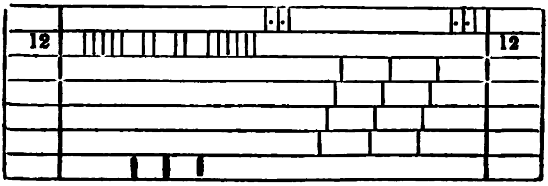


25 splits in the draught.
47 times over.
5 splits selvage, and 5 clear.

In patterns of this kind, the seeding cords which are marked bolder in the draught than the others, are supernumerary, and are taken into the reed along with a splitful of the ground. They must therefore be calculated separately from the warps. Thus, there are 6 seed cords in one set of the pattern, which multiplied by 47, the number of times the draught is repeated, gives 282 for the number of cords in the web. Another example will sufficiently illustrate these remarks.

No. 21.

A 1400 $\frac{4}{5}$ TWEELED VEIN SEED.

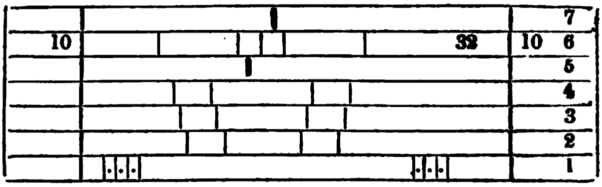


31 splits. 44 times over. 5 splits selvage, and 7 clear.

When spidering forms a part of the pattern, one leaf likewise represents that part of the draught: but as this mounting is usually placed before the other leaves, its representative is sufficiently distinguished from the other varieties of gauze, by placing it in front, as in the following plan.

No. 22.

A 1100 $\frac{5}{4}$ TWEELED SPIDER CORD.



50 splits. 22 times over.

Here the leaf 1 represents the spider mounting; 2, 3, 4, the leaves of a three leafed tweel; 5, a cord leaf; 6, the plain mounting; and 7, another leaf for a cord. In this pattern, each cord is taken into an interval of the reed distinct from the ground.

CHAP. XI.

OF THE DRAW LOOM

SECT. I. OF THE COMPONENT PARTS, AND CONSTRUCTION OF THE DRAW LOOM.

HAVING explained in the preceding Chapters, the elementary principles of Fancy Weaving, exhibited some of their most useful combinations, and illustrated the whole with numerous and appropriate examples, it now remains to show how these principles are extended beyond the power of leaves, by means of the draw loom.

DESCRIPTION.

The principal parts of the draw loom are the carriage and pulley box, the harness and hole board, the tail, the simple, and the lashes. Fig. 1, Plate 11, is a front view of the common draw loom, or rather an outline of it, for the whole could not be represented on paper without running into the utmost confusion. The frame, A A, is called the carriage, from its use in supporting the harness, and rests on the side rails, or capes of the loom, which are seen in section at *a a*. On the top of this frame is fixed the pulley box *e*, which contains the pulleys or whorles, over which the tail cords *b b* run, when any part of the harness is raised to form a shed. This box, a horizontal view of which is given in Fig. 2, is placed in a slanting position, the slope being made sufficient to allow the tail-cords *b*, to sink in opening the sheds, without obstruction from the frame or pulleys below.

The harness is that part of the draw loom which supplies the place of the spotting or flowering leaves; and, exclusive of its appendages, extends from the figures, 1, 2, 3, &c. between *u* and *o* in the carriage, down to the leads *x x*, and is composed of the following parts: namely, the neck twines, which extend from the neck at the figures 1, 2, 3, &c. to the knots at *e e*; the sleepers which connect the neck twines with the mails at *d d*; the mails which are the substitutes for the eyes of heddles through which the warp is drawn, and of which a more distinct view will be found in Fig. 4; the twines which connect the mails and leads, or weights, at *x x*, called hangers, and the leads, which are cylindrical pieces of lead attached to the harness, to sink the mails after they have been raised to form the sheds.

C C is the hole board, through which the sleepers pass, and which regulates the distance of the mails and the fineness of the harness. The face of this board is represented in Fig. 3; in which it will be observed, that the holes for the harness twines run in oblique lines, that the mails, or eyes, may have sufficient room to stand directly opposite to their respective intervals of the reed, without being too much crowded together. The reed and hole board, therefore, must be of the same sett, or fineness; or, should a hole board of a finer sett than the reed be at any time employed, the supernumerary holes must be left empty at regular intervals, and in complete rows, as in the method followed by weavers in setting their heddles. It may be observed, however, that although the setts of reeds in Scotland be calculated on 37 inches, yet the setts of the hole board are comprised in 36; so that in 37 inches of the hole board, there will be the number of splits contained in one inch of any given sett, more than in the same breadth of the reed. As each part or division into which the harness is tied, begins always with a complete row of the hole board, this addition is made as an allowance for any holes that may be left empty at the ends of such parts as are not multiples of five.—Thus, were the harness to be tied into such parts as 60, 65, 70, 75, &c. mails, every part would exactly fill a certain number of rows in the hole board, when there were five in each row; but in a tie of 72, for instance, there would be three holes left empty at the end of each part; which consequently would make the harness considerably broader than the reed, were it not for the above allowance. It may be farther remarked, that although in the present example there are only five holes in each oblique row in the board, which is the number appropriated to four thread harnesses; yet, in split and full harnesses, where a greater number of mails must necessarily occupy the same space, the number of holes in each row is extended to ten. From these observations, it will evidently appear, that two mails, or eyes, will stand opposite to one split of the reed in a full harness; one in a split harness; and in a four thread harness, one mail will occupy the space of two splits.

The tail *b w b*, extends from the knots at the neck to the tail stick *g*, by means of which it is fastened to the roof or ceiling of the shop. From the tail at *w* descends the simple cords *f*, or as they are termed collectively, the simple or symbolt, down to the floor at *z*, where they are fastened by another stick similar to that of the tail. It is on this part of the draw loom that the pattern is read from the design. The twines at *i*, are termed the lashes, or leashes, and are necessary for separating the simples of any shed which is to be opened from those that remain stationary:—*n n* are the heads to which the lashes are attached, and which are made with a noose to run on the gut-cord *l*, at pleasure. The gut-cord commonly extends from the roof of the shop to the floor, parallel to the simple: *k k* are the bridles, which being connected to the lashes, at equal distances, draw them down in succession, as they are wanted by the draw-boy.

The number of mails necessary to produce one set of a pattern, or, as it is termed in leaf mountings, once over the draught, make what is denominated a part, or the tye of the harness: and, as every mail in one part must rise independently of the others, each must have its respective cord, both in the tail and simple; so that the greater the range of the pattern, the greater will be the number of simple cords. Hence, it is evident, that were a harness to be tied in one part only, there would be a tail and simple cord for each mail in the breadth of the web. But as patterns of this extent are not very common, it is usual to divide the harness into such a number of parts as may be most suitable to that species of goods on which it is to be employed; and these parts are repeated, to make up the full breadth of the web. By this means, the number of tail and simple cords, together with the pullies, will be diminished, in proportion as the number of parts in a given harness are increased. It is also obvious, that as each simple cord is connected, by means of its tail cord, to a corresponding mail in each part, the pattern which is produced will be merely the same group of figures repeated as often as there are parts in the harness.

CONSTRUCTION.

When a harness is to be mounted, or built, as some term it, a frame such as is represented in Fig. 6, must be procured, and the two upright sides A A, called standards, are fastened to the inside of the loom, one on each side, and in the very same position between the cloth and warp rolls, which the harness is afterwards to occupy. The cross bar of wood, or slabstock *a a*, slides up and down in grooves cut in these side pieces or standards, and may be fixed with small bolts at any given height, to suit the position of the mails after the harness is tied. In the upper edge of the slabstock, which is somewhat rounded, is a groove, into which the under ends of the mails are inserted during the process of mounting the harness.

The frame or standards being thus adjusted, the operator proceeds to hang the leads, or connect them to their respective mails. This is effected by taking one end of the harness twine, cut of the proper length, through the under hole of the mail, and again through the hole in the upper end of the lead; after which both ends of the twine are stretched down below the slabstock, one on each side, where they are knotted, and the knot slipped down to the top of the lead, so as to be clear of the warp when the sheds are opened; the distance between the mail and the lead being about nine inches. A more durable method of hanging the leads, however, is to take both ends of the twine through the hole of the lead, and then turning them both backward, one on each side, to knot them together. These twines or hangers are made of flaxen yarn, from three to five ends laid together and well twisted, but the number of ends depends much on the weaver's choice. This is the same kind of twine which is used in the construction of heddles, mentioned in pages 2 and 3.

The harness leads are made by cutting a piece of sheet lead into long square slips, and afterwards drawing them through circular holes, of different diameters, in a steel plate, till reduced to the requisite size, after the manner of drawing other metallic wires. They are afterwards cut of the proper lengths; and the weight suitable for any harness is estimated by the number of these pieces in a pound. Thus, for the borders of shawls, in the cotton manufacture, the leads are from fourteen to sixteen inches long, and those for the bosom or filling, from eight to ten. The weight of leads for a four thread harness will be about fourteen in the pound for the borders, if intended for shawls, and from forty-five to fifty-five for the bosoms, according to the number of parts into which the harness is tied; for the greater the number of parts, the more leads will be attached to each simple cord, and therefore they must be proportionally lighter, and the contrary. The leads for the borders of a two thread, or split harness shawl, are the same as those of the four thread, provided the borders are not gathered; but for gathered borders, which doubles the number of leads attached to each simple cord, they are from twenty to twenty-five in the pound, and of the same length as the fourteen. The bosom or body leads are from fifty to sixty in the pound, according to the number of parts in a given breadth of the harness, and the number of lashes requisite for the pattern; for it is evident that the more lashes there are on the simple, the greater will be the friction on the simple cords in passing through them; and consequently the heavier must the leads be to sink the mails after being raised. Full harnesses, in general require leads from eighty to a hundred in the pound, for the bodies of shawls; but if the parts into which they are tied be numerous, the leads are sometimes used as light as a hundred and ten. The border leads of full harness shawls are the same as those of the split harness.

When the leads are all hung, and the under ends of the mails inserted in the groove of the slabstock, a piece of strong wire flattened by passing it between a reedmaker's rollers, is run through their eyes, by means of which they are all kept at the same uniform height. The wire is then tied firmly to the slabstock with pieces of foot twine, at such distances as are sufficient to prevent the wire from bending, or allowing any portion of the mails to rise higher than the others while tying the neck; all of which process will be apparent, by referring to Fig. 6.

When eyes are to be formed in the harness instead of mails, the wire above-mentioned is used in the round state. These eyes are cast on the round wire after the leads are hung, by taking that part of the twine called the sleeper, through the upper bow or loop of the hanger; then taking one end on each side of the wire, and casting two knots, after the manner of making eyed heddles. As it would be difficult, however, to extricate the wire out of so many knots, all pretty tightly tied, a small slip of wood is placed on the top of the wire where the knots are tied, and drawn out gradually as the operator proceeds, leaving the wire only in the eyes at the end of the process. This gives relief to the wire, and allows the eyes to be shifted with ease to their respective places in the hole board.

When the sleepers are thus attached, either by forming eyes, or taken through the upper holes of their respective mails, they are divided into the parts or portions in which the harness is to be tied; the number of which, and mails in each, having been previously ascertained. The holes in the hole board are then counted off for each part, commencing with the hole nearest the right hand selvage, which, if a right hand harness, will be in the front as at *a*, but in the backmost row on the board, if a left hand harness. Changing the position of this hole from the front to the back row, is effected merely by turning up the other face of the hole board. Then if the part be composed of any number of fives, as 50, 55, 60, &c. ten, eleven, twelve, &c. of the oblique rows are set off for each part, respectively; but if the part is not divisible by five, as for example, 64, then there must be thirteen oblique rows appropriated to each part, which will leave one hole empty at the end of each, as was formerly observed. The sleepers are now taken up double, through their respective holes in the board, in the same succession as an over and over draught, each part, as already noticed, beginning with a complete row.

The hole board is next fixed very firmly in the centre of the loom, exactly in the same situation in which it is afterwards to stand, and at the height of about seven inches above the mails. The sleepers, which are made of the same twine as the hangers, are in length, from the mails to the knots above the hole board, about fifteen inches. The position of the harness in the loom will depend, in a great measure, on the nature of the work in which it is to be employed. Thus, for example, a pressure harness must stand farther than a full harness from the slabstock, which is that wooden bar over which the cloth passes to the receiving roll. The common distance of a pressure harness from the slabstock, is about twenty-two inches; of a full harness, eighteen; and of a seeding harness, which, in general, is placed before the ground leaves, about twelve. The height of the mails in a full harness is about three-fourths of an inch below the level of the slabstock; in the split and four thread harnesses, the mails should stand about an inch, or inch and quarter below this level; and to these respective heights the hole board must be accurately adjusted.

The mails being now divided into parts, the sleepers of the first part are laid over the edge of the hole board on one side, and those of the second on the other; and so on, alternately, that each part may be kept distinct from the others. Then the twine or sleeper attached to each mail, being now double, is knotted to its respective neck twine, which must be cut of a length sufficient to reach from these knots to the ends of the tail cords at the neck. This process is denominated beeting the harness. These neck twines are made of three ends of flax yarn, well twisted, and weigh from two and a half to five and a half ounces per hank of four cuts: the coarse twine being employed for those harnesses which are divided into the fewest parts. These neck twines, however, will vary in length, according to the breadth of the harness. For example, for a harness fifty-four inches wide, the neck twines may be about from four, to four feet six inches long.

In the process of beeting the harness, the snitch knot used on the treadle cords is sometimes employed, to enable the weaver to temper any of the twines that may have been slacker or tighter tied than the others; and this is effected, when the neck twines are single, which is commonly the case for light fabrics, by casting a loop knot on one end, and forming it into a snitch, through which the two ends of the sleeper are taken, and knotted in the usual way to prevent them from slipping. In some harnesses, however, which are intended for stouter fabrics, the neck twines are taken double; in which case, the two ends of the sleeper are tied together, and formed into a snitch, through which the two ends of the neck twine are taken, and afterwards knotted.

Before the operator can proceed farther, the tail must be warped; which is effected by winding the twine of which it is composed round two nails or pins fixed in the wall or other convenient place, at a distance from each other equal to the whole length of the tail, and which is commonly about fourteen feet; though some tails are now made as short as twelve. This part of the draw loom is made of what is termed by the spinners of this article, unlaid twine, a quality which prevents it from untwisting after it is tied to the neck twines of the harness. It is commonly made of yarn spun from Dutch flax, three ends or plies well twisted, and reeled into hanks containing 144 feet; from 19 to 22 of these hanks weighing a pound. Each hank, therefore, will produce ten tail cords, fourteen feet long, or twelve of twelve feet.

When the requisite number of tail cords, which must always be equal to the number of mails that are to rise independently of each other, are thus laid together, a lease is formed at one end, and the loops cut at the other. At the lease end, the loops are separated into small parcels, commonly five in each, and formed into snitches, by which they are fastened at equal distances, round the tail stick, so that they may stand nearly equal to the breadth of the tail. This piece of wood or tail stick is fastened to the ceiling of the shop, as represented at *g*, Fig. 1. The other ends of the tail cords are taken through the pulley box, with the assistance of a small hook, in the following order, that is, supposing the tail cords to be numbered 1, 2, 3, 4, &c. from the back of the tail as they occur in the lease, and the pulleys in the box, Fig. 2, likewise to be numbered 1, 2, 3, 4, &c. from the bottom of the backmost row at *a* to the top at *b*; then, the first ten cords will pass over the pulleys from 1 to 10, respectively; the second ten cords, over the pulleys from 11 to 20; the third ten, over 21 to 30; and so on, always commencing each row of pulleys at the lower part of the box *a*. All these arrangements being made, and a wooden frame, called mounters or justers, such as that employed in mounting leaves with coupers, is fixed to the cape of the loom and over the tail at *w*, to keep the cords equally tight and at the proper angle, the harness is ready for tying.

In the plan of a harness, Fig. 1, it will be observed, that there are ten mails numbered on the edge of the hole board, which is repeated four times; indicating that the harness is tied in four parts of ten mails each, which supposes only one row of holes in the hole board. But as there are five such holes in the board, Fig. 3, though, to save room in the Plate, there are only sixteen oblique rows, the harness may be calculated upon fifty mails for each part, which, though still on a very limited scale, will be sufficient to explain the principles on which the draw loom is mounted. Then either one or more assistants, as the extent of the harness may require, are stationed at the side of the hole board, to take up the harness twines in the order in which they occur, and hand them up to the person who ties the neck. In this example, the right hand twine of each part is selected and given to the operator, who ties all these four twines to the tail cord, numbered 1, or that which passes over the first pulley in the box, as already mentioned. By the time this is tied, the second twine of each part in succession is ready to be handed up, which the operator ties to the second tail cord, marked 2; and so on with the others, till the fifty be tied, which in this example occupy one half of the box. It must still be remembered, however, that when the first ten tail cords are tied, which completes the first row of pulleys, the operator must commence again at the bottom of the box as at first.

The knot here employed is formed by taking the ends of the four neck twines in one hand, and the end of the tail cord in the other; then laying the former over the latter, the operator takes the turn of a knot on the upper part of the tail cord, or that part immediately above the figures in the drawing, with the part which he holds in his hand, then another knot round the same with the ends of the neck twines.

The principal care to be taken in tying the neck is, that the twines from the different parts be equally tight, and that the knots be all in the same horizontal line, sufficiently far below the pulleys to prevent their coming in contact when any part of the harness is raised. To assist the operator in this, he places a rule or scale along the inside of the carriage in the position *u o*, in a line with one edge of which he ties his knots, and this scale he shifts forward as each row of cords is tied. On the same scale are marked the distances at which the ends of the tail cords should descend vertically, so that the harness may hang perfectly plumb in the loom after it is completed. Before the tying commences, however, a lead is suspended by a piece of twine from the centre of the pulley box *e*, to which the centre of the harness is accurately adjusted: or which is more accurate, two leads are suspended, one over the fifth, and the other over the sixth pulley at the centre of the box, counting from the bottom, and half the distance between these will be the position of the centre of the hole board.

The next step of the process is to warp and apply the simple, which is prepared in every respect in the same manner as the tail, though only about six feet ten inches, or seven feet long, less or more, according to the height of the shop. It has also a lease formed at its lower end, for the convenience of selecting the cords when required. This lease however is merely temporary, being retained no longer than while the simple is tying to the tail, from which it can at any time be recovered when it again becomes necessary. The operator now ties each cord of the simple to its corresponding tail cord at *w*, each of the cords being readily found in succession from its respective place in the lease. In order however, that the knots of the simple may not be too much crowded on the tail, the simple cords are usually tied in two, three or more rows, according to the number of cords which it contains, as represented in the Fig.

The simple is made of what is termed laid twine, which distinguishes it from that of the tail, and weighs from twenty to twenty-seven hanks in the pound; but in every other respect it is the same as the tail twine formerly described, consequently, one hank will produce twenty simple cords, seven feet long.

The lashes *i i*, are formed by taking the lash twine round certain portions of the simple cords, as pointed out by the pattern on design paper, to be explained in the next section, and which, as formerly noticed, serve to select the simple cords of each particular shed. Each turn of the lash twine round any part of the simple is called a tack, and the whole number of tacks requisite for one shed constitute a lash.

Lash twine is now commonly made of cotton yarn, about No. 48 water twist, and from six to eighteen ends or plies laid together and moderately twisted; for too much twist causes the twine to curl on the simple, and obstruct the draw-boy's progress. The twine composed of the greater number of ends is chiefly employed for stout fabrics, or where only few lashes are requisite for the pattern; but the more lashes that are on the simple, the finer kind of twine is applied, to occupy less space, and afford the draw-boy sufficient room to work. The length of the lashes, exclusive of the heads, is commonly from eight to twelve inches, according to the breadth of the simple; for were short lashes, for example, to be employed on a broad simple, the simple cords on each side would be drawn into an oblique position by the draw-boy's hand, before they could be brought to act along with those in the centre, and consequently form a very irregular shed.

The heads *n n*, are small pieces of twine, which, as formerly observed, connect the lashes and the gut cord, on which they are made to slide up or down at pleasure, each lash having its respective head. These heads are made of foot twine when only few lashes are necessary, but of snitch twine when they are more numerous. The length of twine requisite for each head is from nine to ten inches; and when the two ends are laid together and knotted, the length in the double state, will be from four to four and a half inches. The head is taken through a snitch formed by the loops of the lash, and is prevented from slipping by the knot on the end. On the loop end is formed a noose which runs on the gut cord.

The bridles *k k*, which are tied to the heads, for the purpose of drawing the lashes down or up in regular succession, are made of snitch twine, and are generally from nine to thirteen inches between the heads; the longer ones being necessary when the draw employs what is termed a *dog.*

The gut cord *l*, which extends from the floor to the ceiling of the shop, or at least to the height of the tail, is generally composed of three, four, five or more smaller cords, laid together without any twist. Those made of cotton are preferred to such as are made from flax or hemp, on account of its softness, and having less tendency to cut the heads of the lashes.

For the smaller sized patterns, which require only a few lashes, one gut cord is fully sufficient; but when the lashes become more numerous, it is customary to have two, and the heads are attached to them alternately, as represented in Fig. 8. Moreover, all covered work requires additional gut cords, one for each cover or colour. When four or more gut cords would be necessary, however, it is now common to employ only two, and to put on the lashes with cross bridles. These will be easily understood by referring to Fig. 9, in which *w* and *x* are two gut cords, placed at the distance of eleven to thirteen inches from each other, according to the number of covers or variety of colours in the pattern. The cross bridles extend horizontally from *a* to *e*, or from *d* to *o*, between the two gut cords, on which they can be shifted up and down by the draw-boy at pleasure. They are made of foot twine, two ends laid together, and a knot tied for fixing the head of each colouring lash at the distance of one inch from each other; those at the end being about two inches from their respective gut cords, as represented by the Figs. 1, 2, 3, 4, 5. Thus, if the lash at 1 were for green, at 2 for dark blue, at 3 for red, at 4 for yellow, and at 5 for light blue; then, when the draw-boy takes down the cross bridle *d o*, on which there are lashes for all the five colours, and which he draws in succession, beginning with the lash 1 for the green, then 2 for the dark blue, 3 for the red, 4 for the yellow, and 5 for the light blue, he then shifts down this cross bridle, and replaces it with the one marked *a e*; but on this the lash 4 for the yellow is wanting, so that he has only the lashes 1, 2, 3 and 5 to draw in succession on this bridle, for the green, dark blue, red, and light blue, respectively.

By referring again to Fig. 1, it will be observed, that as the harness twines incline from the hole board to the neck in very different angles, those towards the selvages, especially of broad harnesses, being much more oblique than those near the centre, it will follow that, when any portion of the simple cords is drawn down to form a shed, all the mails cannot rise to the same elevation; and therefore the sheds thus formed, will be not only very irregular, but in many cases wholly impervious to the shuttle. To obviate this inconvenience, two wooden rollers are placed in each space between the rows of tail cords at the neck, or at the knots, 1, 2, 3, &c. one on each side of a row, and the ends of these rollers turn on two pieces of wood, one fixed on each side of the carriage at *u o*. By this means all the harness twines, however oblique, will rise vertically between the rollers; and consequently all the mails will be raised to the same uniform height in opening the sheds.

When the harness and all its appendages are completed, it is disengaged from the frame or standards, in which it was built, the frame of wood or justers, which was fixed above the tail at *w* removed, the wire drawn out of the mails, and the slabstock taken out of the hangers. But in order to preserve the progressive order of the mails for drawing in the warp, a shaft or rod must be introduced into the place of the slabstock before it is taken out, by which means the mails will come to the weaver's hand in regular succession, as he has occasion for them in entering his warp, without the necessity of having recourse to the hole board. The harness should now retain the very same position which it occupied while fixed in the frame, both with respect to the height of the mails and their distance from the yarn roll and slabstock.

The process of drawing the warp through a harness, differs very little from that formerly explained under tweeling. After the warp is taken through the harness, however, a new lease must be forced through the eyes, or mails, from the rods behind, for the purpose of taking it again through the ground leaves.

When the tail of a harness extends across the shop on the weaver's right hand while on his seat, as in the example Fig. 1, it is termed a right-hand harness: but were the situation of the loom to require it to be tied on the opposite side of the shop, it would then be denominated a left-hand harness; but all the tail and simple cords would retain their relative positions and connexions, only what is here the top of the pulley-box would become the bottom, and the right-hand side of the simple, in the present case, would become the left. This distinction must be particularly attended to in reading the patterns on the simple, which will be further explained under that head.

It may be again observed, that in Fig. 1 the tying of the harness commenced at one side, or at the figure 1 in the hole board in each part, and continued in regular succession till finished. This is the most common form of the harness, though other varieties are occasionally adopted. Had, for example, the mails numbered 1 in the two parts on the right, and those numbered 10 in the two parts on the left, been tied to the first tail-cord, or that marked 1 at the neck; and the others in regular order from the outsides toward the centre; this would be denominated a gathered harness, and would produce this effect, that whatever position the patterns assumed in the two right-hand parts, they would stand reversed on the other two; or if stripes were to run diagonally from the right side in the two former, they would change their direction in the two latter, and meet in the centre of the web. In harnesses of this kind, however, it will always be found advantageous to terminate the tying with an odd mail in the centre, which prevents the appearance of the teething mentioned under Paper Spots.

Again, were the same example, Fig. 1, to be taken for the bosom or filling of a shawl, and that a border of fifty mails were to be added, it is obvious, that an additional tail and simple of fifty cords each, would be requisite, which would exactly fill the pulley box represented in Fig. 2, and the tye of the harness would be said to be fifty bord and fifty body. In this case, the fifty pulleys in the back part of the box, at *a b c d*, would be appropriated to the border, and the remaining fifty to the body.

In tying a harness for shawls of this kind the operator may commence either with the border or body. If he begin with the border, the tail cord which passes over the first pulley, numbered 1 in Fig. 2, is tied to the first neck twine of each border, or those at the extremities of the hole board at *a* and *e* Fig. 3. The second tail cord is tied to the second neck twine of each border, counting from the two selvages, and so on with the others till the borders be tied; observing, as formerly directed, that when the first ten cords in the pulley box are tied, to commence the second ten at the bottom of the box; and, consequently, the border will end at *c*. After the border is tied, the body begins with the tail cord which passes over the fifty-first pulley, or the first in the body part *c d e f*, and proceeds in every respect as has been already explained.

Had the tying commenced with the body, the process would have begun with the tail cord which passes over the first pulley, at the corner *e* of the box, or that which was last in the preceding method, and proceeded on in the contrary direction till finished; and then the border would begin with that tail cord which passes over the first pulley at the left hand in the sixth row, counting from the front, and in this case the harness twines nearest the selvages would be the last tied. Hence it is evident, that in tying the borders, the right hand mail on one side, and the left hand mail on the other, are connected to the first tail cord; the second of each, in succession, to the second tail cord, and so forth;

but in the body, the tying of each part always commences at one side, and proceeds regularly to the other, except in the case of a gathered harness, which would have continued inward to the centre, or outward to the selvages, in the same manner as the borders. The body parts of the harness may therefore be considered as an extension of the spot draught, No. 48, page 215, the borders as a part of the diamond draught, and the gathered body, as the diamond draught on a more enlarged scale, which may all be carried to any practical extent.

But although the two borders in this example be actually gathered, yet this mode of tying does not produce what is commonly understood by a gathered border. In tying the latter, the two outside mails of each border are connected to the first tail cord, counting from the body; the two next in succession, to the second; and so on till they meet in the centre of the borders, when, in a right hand harness, the last tail cord will be at the right hand side of the tail. Hence it is obvious, that the tye of each border will form exactly what is termed the diamond draught; and consequently one half of the pulleys, tail, and simple, will produce a border of the same extent as the preceding method, although the diversity of patterns will be much more limited.

Sometimes corners, and frequently both corners and a centre flower are woven on shawls. In the former case, the border parts are made of a size sufficient to include the corners, but in the latter, a part equal to the size of the centre flower must be gathered in the middle of the harness. These, however, will be farther explained in the next section, under the Designing of Patterns.

CROSS'S COUNTERPOISE HARNESS AND MACHINE FOR SUPERSEDING THE USE OF THE DRAW-BOY.

A machine that would effectually supersede the use of draw-boys in the various branches of harness work, without deteriorating the quality of the cloth, has long been a desideratum in fancy weaving; and many attempts have been made, from time to time, to supply so great a want. But all the attempts that have been made in this country, especially such as were constructed on general principles, have either proved abortive, or have at last been confined to particular branches of weaving.

The machine called the counterpoise harness, invented by the late James Cross, Paisley, promises, however, to be of general utility to harness weavers, especially for weaving imitation shawls, plaids, and other heavy covered goods. This machine, taken as a whole, consists of three distinct parts; one properly called the counterpoise harness, another, an apparatus for preparing the lashes, and the third, a treading machine. Fig. 1, plate 13, is a front view of these three parts connected together as they stand in the loom. The harness F is the very same as in the common draw loom, already explained, till it reaches the neck, where the counterpoise apparatus commences. The principal part of this apparatus is contained in the upright frame A A, and the whole is supported by the carriage E E, which rests on the capes of the loom, as in other draw looms. In the frame A A are four boards, *e*, *u*, *v*, *i*, which are perforated with a number of corresponding holes, equal to the tye of the harness or size of the simple. The two boards *e*, *i*, are morticed into the bars *d*, *d*, which are fixed in the upright frame A A; the former of which is called the suspension board, from its bearing the weight of the harness and leads, and the latter, the neck, or directing board, as it answers the purpose of rollers, as well as keeps the neck cords at regular distances. The other two boards *u*, *v*, which are morticed into the moveable bars *m m*, called the arms of the trap boards, have their holes of a sufficient size, about a quarter of an inch diameter, to allow the knots on the cords *o*, to pass freely through them; and at the side next the simple, there are saw draughts, or cuts in the edges of the holes, to admit the cords, but support the knots, as represented in Fig. 2. These cords, which are termed knot cords, and are substitutes for the tail, have two rows of knots *o*, *o*, for the purpose of raising the harness by the trap boards. They are fastened to the suspension board *e*, by means of the holes made for that purpose, and are taken down through both of the trap boards to the neck *i*, where they are tied to the harness. K K, are two circular pieces of wood, called rotators, which revolve on iron axles, that run through to the opposite side of the frame, where other two rotators are similarly fixed. *z*, *z*, *z*, *z*, are small bars of wood, called pushers, and which connect the trap board arms to the rotators on each side of the frame. *w* is a wooden rod which connects the rotators; so that whatever motion is communicated to one, is instantaneously transferred to the other. L is a bar of wood, with a corresponding one on the other side of the frame, on which the axles of the rotators revolve, and their height is regulated by the nuts and screws *y*, *y*.

The process of tying the counterpoise is the same as in the common way; for the operator commences tying the neck at the back row of the holes in the neck board, and the other rows follow in succession; always beginning each row at the same side of the board at which the tying commenced, as from *a* to *b*, if it commenced at *a*, &c. as in the pulley box of other draw looms. In the Fig. there are only two of the knot cords tied to their harness twines, F, the first and last of each row, to prevent confusion. *a* is the hole board, *b* and *c* marches, and G heddles.

Now, it is evident, that when the rotators, K K, are turned round to the right, which is effected by means of a cord connected to a treadle, the pushers, *z*, will raise the trap board, *u*, and sink the trap board, *v*; and when the rotators are turned the contrary way, the motion of the trap board will be reversed. Consequently, were a portion of the knot cords drawn into the saw-draughts of one trap board for one lash, and the knot cords of another lash into the other trap board, one spotting shed would be rising while the preceding one would be sinking; and this is the principle of the counterpoise harness.

The next part of the machine is that for drawing the knot cords into the saw cuts, and is chiefly contained in the frame between A and B. In this apparatus, the simple *r*, *r*, is extended horizontally at the top of the frame A B, each simple being tied to its respective knot cord above the neck: afterwards it is continued, by the addition of other pieces of twine to *q*, where it is supported by a half leaf of heddles, and again to the wall or shop window, where the ends are fastened. At *p* are leads, one attached to each cord, to recover the knot cords after the draught, and *l*, a hole board for regulating their distances. *s*, *s*, are gut cords for keeping the heads of the bridles open for the hooks. S is the lash driver, and R the shaft which communicates the motion from the whorle T, which is acted upon by a treadle, and on the axle of which are a number of eccentric whorles, one for each cover, for gaining power in the preparation of the lashes. The form of these whorles will be seen at Fig. 4. *g* is an inclined plain, moveable on its centre, over which the lash driver moves on small castors, in approaching the harness, and below it when returning with a lash. Fig. 3 is a front view of the lash driver; showing likewise the manner in which the lashes, simple, and cross bridles are connected.

The dots at *a*, represent the ends of the simple, *b*, the lashes, *c*, the heads of the lashes, and *e*, cross bridles. The position of the hooks, *a*, Fig. 5, for drawing the lashes is pointed out at *d*. *g*, *g*, *g*, *g*, are iron pins which drive the lashes to their proper place for the draught. *h*, *h*, are the small castors on which the lash driver moves. Fig. 5, is a view of one of the tumblers or levers, in which is fastened the hook *a* for pulling down the lash. The two parts, *a* and *b*, are opened by means of cords connected to the treadles when they are in the position to catch the head of the lash, but shut again by their own gravity, as in the Fig. before the lash is pulled down. There are one of these levers for each cover, and their position in the frame is exhibited by the dotted lines at N, Fig. 1. P is the frame in which these levers are placed, and which will be seen to more advantage at Fig. 6, where 1, 2, 3, 4, are the ends of the levers, and the small pulleys, *i*, have cords running over them, to recover the levers after the lash is drawn. *h* is the escapement for opening the hooks, and allowing one set of lashes to escape and another to enter. Q is a roller flattened on one side, to allow the levers to play when the machine is working. This roller has a string connected to the escapement and another to the hook presser. In the hook presser are wires fixed that press on the under part of the hooks. These different parts, which are shown in the drawings as connected in the loom, are put in motion by means of treadles and marches, as in the ordinary way of mounting fancy looms.

The treading machine is next to be explained; the frame of which is seen at H, Fig. 1, but the several parts are more distinctly represented at Fig. 7, the principal of which are as follow: 1, is a knee shaft; 2, short marches, one for each leaf; 3, a couper for turning the trap board 5; 4, a long march for working the drawing machine. *a*, *e*, *i*, *o*, are the ends of the treadles: *a* for opening a flowering or counterpoise shed, *e* for a ground shed, *i* for a counterpoise shed, and *o* another treadle for a ground shed. 5 is the wheel or pulley of the trap board, represented at *c*, Fig. 8. 6 are the knots on the raising and sinking cords, and 7 are mails attached to them. 8 is a weight for recovering the machine, and 9 are weights for balancing the mounting. 10, 10, are hole boards for conducting the knot cords, one of which is seen at 10, Fig. 9. *c*, *c*, are weights for balancing the conducting cords; *w*, a cord for conducting the pressing knot cords; *y*, for conducting the raising knot cords, and *z*, weights for keeping the knot cords tight. *a*, Fig. 8, is a view of the trap board, and *b*, of the pressing board, each with their holes and saw draughts, where the knot cords play. Fig. 9, is a side view of the machine, in which 1, 2, 3, 4, are the ends of the shafts, marches, and couper, represented in Fig. 7, with the same figures of reference. The tweeling cords are tied to the marches 2, brought down through the board 10, and attached to the mails 7, which guide the knot cords into the saw draughts. These cords are arranged according to the plan of the tweel to be woven. As *o* and *e* are the two treadles for the ground, when either of them is pressed down, the pulley 5 is turned round, and opens a shed, and while one foot is tread, the other prepares the knot cords for the next shed.

FRENCH DRAW LOOM.

Since the introduction of Mr. Cross's machine into the trade, another apparatus for superseding the draw boy, has been imported from France, which, for simplicity of construction and operation, far excels any attempts at the improvement of the draw loom that have hitherto appeared in this country. This loom has neither tail, simple, nor lashes; and the pattern, which is cut out on small pieces of pasteboard, may be changed without the weaver stopping his shuttle.

The harness of this draw loom, see plate 14, Fig. 1, is constructed, from the neck upwards, similar to Cross's counterpoise; having knot cords arranged in the very same manner, but only one trap board. E and A are the carriage and uprights, as in Cross's machine; C, the knot cords, and *a*, the trap board, the same as represented at Fig. 2, plate 13. *i* are needles, or pieces of wire, one attached to each knot cord by taking a turn round it. *d* is what the weavers term the cylinder or barrel, though it is an oblong square piece of wood, perforated with holes on each of its four sides, equal to the number of the needles employed, as exhibited in Fig. 2. This barrel, besides its rotatory motion, vibrates on pivots like a pendulum. *b* are small pieces of pasteboard, about ten inches long, and from two to three broad, perforated with holes to receive the ends of the needles, and are arranged agreeably to the order of the tacks in lashing the pattern for the other draw looms, as shown at Fig. 3. There is one of these pasteboards for each lash; and all the boards for one pattern are connected together like an endless chain, with twine, at equal distances, so as to fit exactly the flat faces of the barrel. *g* is the receptacle of the pasteboards; and, in some looms, is composed of thongs of leather suspended from the guide *s*, at one end, and from the cape of the loom at the other. In other looms it consists of parallel slips of wood, connected together with cords. D is a lever for raising the trap board, to which it is connected by means of the circular pieces of iron *x*, one on each side, with a bar across, to the centre of which the end of the lever is connected by a piece of wire. *o*, *o*, are cross bars of wood, with holes in their centres, through which run pieces of strong iron wire, which are fixed into the trap board at each side, to keep it steady while in operation. At *m* are spiral springs, for regulating the motion of the needles; and into the cross bar of wood, *r*, is inserted another piece of wood, moving on springs, which yields to the pressure of the needles, which are forced back by the barrel, and recovers them when the barrel is withdrawn. Fig. 4, is an end view of the barrel with the apparatus for turning it round, which, like the rest of the machine, is extremely simple. It consists of two catches, *b*, *c*, which are attached to the opposite end of the frame. When the barrel is turned round from right to left, the catch *b* is lowered by means of a cord connected to a treadle, till the tooth of the catch, *i*, comes in contact with the corner of the barrel in its motion backwards, and turns it round till a new face and pasteboard are presented to the needles. When it is turned from left to right, the catch *c* is employed in the same manner. *z* is a cord connected to the barrel, which, after passing over two pulleys, as seen in the Fig. is tied to the end of a long march; and *y* is another cord which descends from the lever D, to another long march; and these two marches are connected to separate treadles, which are wrought alternately.

From this description of the machine, its mode of operation will be obvious. The weaver presses down the treadle which pulls back the barrel *a*, by means of the cord *z*, and in this state all the knot cords are into the saw draughts of the trap board. As this treadle is relieved and the other pressed down, the barrel is drawn by springs against the ends of the needles, which enter into the pasteboard wherever there is a perforation, but where there is none, they are driven back; and, consequently, drive their respective knot cords out of the saw draughts of the trap board, which are thus allowed to remain stationary, while the others are raised.

The reading of the patterns on these pasteboards is the only tedious process connected with the machine. The method in common use is, for one person to read over the tacks of the design, and another with a punch to strike out the holes in the pasteboard, agreeably to his instructions. Thus, on the line 1, Fig. 3, there are three dots, which denote three holes for the wires. The person who gives the instructions, says, take 3. The other person immediately strikes out these three holes with the punch. Then, as there is a blank on the upper cross line, and two on the under lines at 2, three are ordered to be passed. Then 2 on the line 2, and 3 on the line 3, are next to be cut out; and so forth, always beginning at the bottom of the lines, as in the process of taking the harness twines through a hole board. In this example there are only four cross lines or rows of holes, but in practice there are eight, corresponding to eight horizontal rows of the needles. The four small holes on each end of the pasteboards are for laceing them together, agreeably to the succession of the lashes. The larger holes, *a*, *a*, are made to fit the studs, *a*, Fig. 4, on the ends of the barrel, by which the pasteboards are drawn into their proper positions to receive the ends of the needles.

THE PATENT OR COMB DRAW LOOM.

The patent or comb draw loom was invented some years ago, by Mr. David Bonnar at Dunfermline, and has since been chiefly employed in the manufacture of that place.

The principle on which this draw loom is mounted is, that that part of the harness which corresponds to the tail of the common harness, instead of extending across the roof of the shop, is here tied perpendicularly in a frame, which is nailed to the carriage or table above. From each of these tail cords a simple cord extends, horizontally, back over the weaver's seat, as in the back harness, the lashes hanging below, ready to be pulled by the weaver's hand instead of the draw-boy. A little above the simple, there is a knot tied on each cord of the tail; all of which knots must be in a straight line, and equally high. Hence, the tail cords in this harness are called knot cords. Below these knots, and above the simple, is placed a flat board, moving upon pivots, one edge of which is indented so as to resemble the teeth of a comb, from which it has derived its name. To the opposite side of this board or comb, is nailed a long handle or lever, which, when pulled down, raises the indented side, or teeth, after the knot cords have been drawn in between them by the lashes. To the other end of this lever is fastened a strong wire, or cord, which descends through the warp, in broad webs, or past the selvage in narrow ones, and is fixed by the other end to a stout treadle below, clear of those which are used for the ground. Hence, when any shed is to be opened by this harness, the weaver pulls down the corresponding set of lashes, which draws the knot cords of that shed between the teeth of the comb, while at the same time he presses down the treadle that is thus connected to the comb, with his foot, and places it in a catch below, where it remains so long as he has occasion for the harness shed.

SECT. II. OF DRAW LOOM PATTERNS.

THIS is perhaps the most important, as well as the most delicate department in the whole course of fancy weaving; for it is on a judicious selection and extensive variety of patterns, combined with economy in the disposal of colours, that the success of the manufacture will ultimately depend. The manufacturer, therefore, though no designer himself, should possess a competent knowledge of drawing, or at least of hand sketching. This would not only improve his taste, but would enable him, when any new or striking objects occurred, to communicate his ideas with precision to the pattern drawer, and to make a more tasteful selection from the productions of others. This is, in general, the case in France; and the consequence is, that French patterns are usually distinguished for the ease and elegance of their style, while the greatest economy is observable in the use of the materials of which they are manufactured.

On the other hand, the qualifications of a pattern drawer, who would excel in his profession, are by no means of a superficial nature. A facility in sketching or delineating any object that may present itself, whether natural, artificial, or imaginary, combined with a thorough knowledge of the principles of weaving, at least with those branches with which he is more immediately connected, are indispensable requisites. The pattern drawer, like the poet and the painter, ought to possess an unlimited fancy, and a strong and lively imagination; to be deeply impressed with the beauties and charms of nature, and to be able to draw from thence the principal effect of his designs. A chaste taste also, is as necessary in the pattern drawer as in the manufacturer; and this will be greatly heightened and improved by a little knowledge of geometry, particularly of symmetry and proportion; for nothing can be more offensive to a person of genuine taste, than a pattern or picture crowded with an incongruous assemblage of distorted objects.

TASTE.

Since taste therefore is essential in every department of fancy weaving, as well as in other works of genius, while at the same time it is so very difficult to distinguish between a good taste and one of an inferior kind, it would be of use here to inquire what is the standard by which the different tastes of men might be compared, so as to discriminate between the true and the false. As this, however, would lead to a discussion, which, to some might appear foreign to the present undertaking, I shall content myself with quoting a few remarks on taste from Dr. Blair, referring the reader who wishes more information on this subject, to the second, third, and fifth of his lectures on Rhetoric and the Belles Lettres. "Taste," says he, "is the power of receiving pleasure from the beauties of nature and art."—"Nothing that belongs to human nature is more general than the relish of beauty of one kind or other, of what is orderly, proportioned, grand, harmonious, new, or sprightly."—"But although none be wholly devoid of this faculty, yet the degrees in which it is possessed are widely different. In some men only the feeble glimmerings of taste appear, the beauties which they relish are of the coarsest kind, and of these they have but a weak and confused impression; while in others, taste rises to an acute discernment, and a lively enjoyment of the most refined beauties. In general we may observe, that in the powers and pleasures of taste, there is more remarkable inequality among men than is usually found in point of common sense, reason, and judgment."

"The characters of taste when brought to its most improved state, are all reduceable to two, delicacy and correctness."

"Delicacy of taste respects principally the perfection of that natural sensibility on which taste is founded. It implies those finer organs or powers which enable us to discover beauties that lie hid from a vulgar eye. One may have a strong sensibility, and yet be deficient in delicate taste. He may be deeply impressed by such beauties as he perceives; but he perceives only what is in some degree coarse, what is bold and palpable, while chaster and simpler ornaments escape his notice. In this state, taste generally exists among rude and unrefined nations. But a person of delicate taste both feels strongly and accurately. He sees distinctions and differences where others see none, the most latent beauty does not escape him, and he is sensible of the smallest blemish. Delicacy of taste is judged of by the same marks that we use in judging of the delicacy of an external sense. As the goodness of the palate is not tried by strong flavours, but by a mixture of the ingredients, where, notwithstanding the confusion, we remain sensible of each; in like manner, delicacy of taste appears, by a quick and lively sensibility, to its finest, most compounded, or most latent objects."

"Correctness of taste respects chiefly the improvement which that faculty receives through its connexion with the understanding. A man of correct taste is one who is never imposed on by counterfeit beauties; who carries always in his mind, that standard of good sense, which he employs in judging of every thing. He estimates with propriety the comparative merit of the several beauties which he meets with in any work of genius; refers them to their proper classes; assigns the principles, as far as they can be traced, whence their power of pleasing flows, and is pleased himself precisely in that degree in which he ought, and no more."

"It is true that these two qualities of taste, delicacy and correctness, mutually imply each other. No taste can be exquisitely delicate without being correct, nor can be thoroughly correct without being delicate. But still, a predominancy of one or other quality in the mixture is often visible. The power of delicacy is chiefly seen in discerning the true merit of a work; the power of correctness in rejecting false pretensions to merit. Delicacy leans more to feeling, correctness more to reason and judgment. The former, is more the gift of nature; the latter, more the product of culture and art."

SKETCHING.

Those who would attain to excellence in the art of drawing, should place themselves under the tuition of an experienced master; and even then, they will find that considerable practice and application will be necessary, before much proficiency can be expected. With a little attention and perseverance, however, a person of moderate capacity may acquire as much command of the pencil, as enable him not only to copy any pattern from a sketch or cloth, but also to delineate with accuracy, such objects or ideas as his own fancy may suggest.

The first attempts of a learner in this art should therefore be to acquire a facility in sketching a variety of simple objects, such as straight lines, circles, ovals, and other curved figures. After he has made some progress in these exercises, he may proceed with copying from good sketches, particularly at first, from the most simple specimens of that kind of patterns to which his attention is to be afterwards directed. It must however be observed, that when he has attained as much practice as enables him to sketch from his own fancy, he should be very cautious at first, both with respect to the objects which he selects for his designs, and the manner in which they are to be disposed; for on his taste and judgment in making these experiments will depend, in a considerable degree, his peculiar style afterwards. He will therefore derive much advantage, in the early stages of his progress, by procuring as great a variety of appropriate objects for his patterns as possible, such as leaves, flowers, fruits, shells, &c. which may be copied either from drawings, or the originals: and from this fund he will afterwards, with a little modification of their forms, be able to give a considerable diversity to his designs; at the same time, he ought to avoid, as much as possible, a certain sameness of style, which is sometimes found in the productions even of the best drawers.

Harness patterns are, in general, first drawn on common paper, of the same size that they are to occupy on the cloth, which is ascertained by taking their dimensions from a reed scale; and these are denominated sketches. For patterns which are to be all white, the sketches may be finished with a black lead pencil, either shaded or not, as the pattern drawer may find occasion. In drawing sketches for allovers, or other kinds of running patterns, particular care must be taken where the stalks, or other members join, to avoid stiffness or unnatural turns, and to observe that none of the parts be too much crowded, nor improper vacancies left.—At these joinings, the stalks, &c. may be continued beyond the limits of the sketch until they be completed, or until their curvatures or bendings be accurately ascertained, and then transferred, by means of a bit of spare paper, to the opposite side of the pattern.

For coloured patterns, a rough sketch is commonly drawn out on coarse paper, which, after all the necessary corrections are made, is traced on clean drawing paper, when it is ready for colouring. The method of tracing these sketches is as follows: prepare a sheet of wove writing paper by rubbing it over on one side, first with sweet oil, and afterwards with ground verditure; when it is dry, lay it on the clean drawing paper, and over it the rough sketch. Then with a blunted steel point trace over all the outlines, and a very fine delineation of the pattern will be produced. This done, the different colours are laid on with camel's hair pencils, agreeably to the taste of the manufacturer, or to the style of work to which the patterns are to be applied. It is necessary to observe, however, that as in many kinds of patterns, particularly those intended for low priced goods, the greatest economy is frequently necessary in introducing the colours, the pattern drawer's chief study should be to produce as much effect with as few colours as possible.

Pattern drawers have also frequent occasion to copy extensive patterns from the cloth, such as coloured shawls, pine plaids, &c. This is easily effected by laying a sheet of transparent paper over the pattern to be copied, through which, every object and colour will be distinctly seen, and traced with a black lead pencil; it may be afterwards transferred to a sheet of clean drawing paper by means of a tracing paper and steel point, and coloured in the same manner as the original. For present use, a sheet of silk or tissue paper may be brushed over with sweet oil until it be all thoroughly wet, and when dry, it will be fit for use. But as this paper will soon turn dim by exposure to the air, the following recipe has been recommended in the Panorama of Arts: "Take one quart of the best rectified spirits of turpentine, and put to it a quarter of an ounce of the sugar of lead finely powdered; shake it up and let it stand a day and a night; then pour it off, and add to it one pound of the best Canada balsam; set it in a gentle sand heat, and keep stirring it till it is quite mixed, when it will be fit for brushing over the paper, which, in about four days will be fit for use. The paper rendered transparent is that which stationers call bank post, but when great nicety is required, tissue paper which is still thinner, will be proper. Before it is brushed over with the mixture, after having been made damp by laying it over another damp sheet of stronger paper, it should be pasted by the edges upon a frame, and suffered to dry."

PIGMENTS.

The pigments used by pattern drawers and designers, are, in general, the same as those which are made up into cakes, and sold in the shops under the name of water colours. In water colour paintings, however, such as flowers, landscapes, &c. the pigments employed are chiefly the transparent kind, and the different shades are wrought up by repeated touches of the pencil, till they have acquired their full effect; but in the sketches for patterns, the colours must be all opaque, or of such a body as may be easily laid on the paper with only one touch of the pencil, and at the same time stand distinct, without allowing one to appear through or blend with another. Colours, therefore, which are naturally transparent, must be made opaque, by mixing with them a little flake or other fine white.

The colours used for designing, however, ought to be rather of a semi-transparent nature, that they may not only work freely and expeditiously with the pencil, but that the flower-lasher may be able to see the lines of the design paper distinctly through them. Some of the London designers have indeed carried this idea so far, as to have their design paper transparent, and to paint the pattern on the back with opaque or body colours.

In drawing sketches for most kinds of harness patterns, it is of considerable importance that the colours on the sketch be adapted, as nearly as possible, to the tints of the materials of which they are to be fabricated on the cloth. This would often prevent disappointment in the manufacturer, who, without considerable experience, is liable to be deceived by a brilliant display of colouring on the sketch, which cannot be realized in the loom; and this is more particularly the case in the cotton manufacture, which does not admit of such a beautiful variety of tints as either silk or worsted.

Pattern-drawers, therefore, generally prefer colours of their own preparation, to those sold in cakes, not only on account of economy, but that they can more easily obtain those tints, and of that consistence, which this species of drawing requires. For these reasons, it may not be improper here to introduce a list, with some useful remarks, of those pigments which are most commonly employed in water colour painting, leaving to the artist the choice of those which may seem best suited to that branch of manufacture in which he is more immediately engaged.

The principal colours used in water painting are yellow, orange, brown, red, purple, blue, green, black and white; of the seven first of which there is a great variety of shades, besides their compounds.

YELLOWS.

Gambege is a gum brought from the East Indies. It requires no preparation, but dissolves immediately on rubbing it with the addition of water. It is a fine transparent yellow.

King's Yellow is orpiment, or arsenic coloured with sulphur. It is poison, and ought to be used with caution. It is a good body colour, and when mixed with blue pigments, makes a good green.

Yellow Ochre is a mineral earth, which is found in different degrees of purity. It is a good standing colour.

Masticot or *Massicot* is ceruse or flake white calcined by a moderate fire, but it acquires a lighter or deeper tint according to the degree of calcination.

Chrome Yellow is a preparation of the metal chromium. It is a good working yellow for designers.

Turpeth Mineral is a preparation of mercury, by calcining it together with oil of vitriol. It is a good bright body colour. Mixed with Prussian blue it makes a fine green. Good yellows are also procured from French berries, saffron and turmeric, by dissolving either of them in water; but in order to preserve the bright tincture of the turmeric, it must be dissolved in spirits of wine.

ORANGE.

This colour is usually a compound of some of the red and yellow pigments. Orange lead, which is ceruse calcined to a higher degree than masticot, is a fine bright orange, works very freely on design paper, and is commonly employed in designing patterns of only one colour.

BROWNS.

Bistre is the burnt oil extracted from soot. It is of a fine brown transparent colour, and is sometimes used for washing designs instead of Indian ink.

Umber is an ochrous earth of a brown colour. It stands well, and when burnt gives it a redder hue.

Spanish Juice is the succulent part of the liquorice root, extracted by decoction in water, strained and evaporated to dryness.

Japan Earth is a gummous substance extracted from some kind of vegetable. It dissolves to a great degree in water, and is of a full brown colour inclining to red.

REDS.

Vermilion. This is a bright scarlet pigment, formed of common sulphur and quicksilver. When found in its natural state it is called native cinnabar, but factitious cinnabar, when produced by a chemical process.

Red Lead is merely lead calcined to a higher degree than orange lead, by exposing it with a larger surface to the fire.

Scarlet Ochre is the ochrous earth, or rather iron which is the basis of green vitriol, separated from the acid of the vitriol by calcination. It is of a broken scarlet colour, and stands well.

Common Indian Red is of a hue verging on scarlet, but the true Indian red is greatly inclining to purple.

Venetian Red is a native red ochre, rather inclining to scarlet.

Carmine affords the brightest and most perfect crimson, and is the most beautiful of all reds. It is produced from the tinging substance of cochineal brightened with aquafortis, by a process similar tó that used for dying scarlet in grain.

It produces a variety of fine tints, from the deepest crimson to the lightest pink. It is mixed with the spirits of hartshorn, and reduced to the requisite shades with water.

Lake is a white earthy body, as the basis of alum or chalk, tinged with some crimson dye, such as is obtained from cochineal or Brazil wood, dissolved or taken up by means of some alkaline salt, and precipitated on the earth by means of an acid.

PURPLES.

Purples are commonly prepared by mixing red and blue pigments. A very good working purple for sketches, however, is made from the following recipe: Take eight ounces of logwood, an English pint of rain-water, and an ounce of alum; infuse them well over a slow fire in a glazed pan or earthen pot, for about twenty-four hours; add a quarter of an ounce of gum arabic, let it stand for a week, strain it through a piece of fine cloth, and keep it close. But the richest purple is made by blending carmine and Prussian blue or indigo.

BLUES.

Ultramarine is a preparation of calcined lapis lazuli. It is an extreme bright blue colour, but it is both high priced and often adulterated.

Prussian Blue is the fixed sulphur of animal or vegetable coal, combined with the earth of alum. It is a very useful pigment both in sketching and designing.

Verditer is a fine light blue, formed by a mixture of chalk and precipitated copper. It is without transparency, and is much employed both in sketches and designs.

Indigo is a tinging matter extracted from certain plants, by means of putrefaction, and a coagulation by the air.

Bice is smalt, which is glass coloured with zaffer, reduced to a fine powder by levigation.

Litmus is a blue pigment brought from abroad, and formed from archil, a species of moss brought from the Canary and Cape de Verd Islands.

GREENS.

Green is a compound colour, commonly made by mixing some of the yellow and blue pigments. The following, however, are simple greens.

Verdigris is a rust or corrosion of copper formed by the action of some vegetable acid. It is dissolved in vinegar.

Distilled Verdigris is the salt produced by the solution of copper, or common verdigris in vinegar. It makes a fine light green both for sketching and designing.

Sap Green is the concrete juice of the buck-thorn berries expressed from them.

BLACK.

Lamp Black is the soot of rosin received in sheep skins, or pieces of coarse linen fixed at the top of a chimney, where it is burnt for that purpose. To prepare it for use, put a small quantity on an iron shovel, or in the bowl of a tobacco pipe, and set it over the fire, when it will begin to smoke. When the smoking ceases, the black will be freed from the oily substance with which it was originally combined, and when mixed with gum, will be fit for use.

Ivory Black is ivory burnt between two crucibles; and requires to be well ground with water, before it is used in fine painting.

Spanish Black is burnt cork.

Cherry and *Peach Stones*, and other vegetable substances, when charred in a covered crucible, make likewise excellent black pigments.

Indian Ink. The genuine Indian ink is imported from the east, but the greater part is manufactured in this country; for which the following recipes are given: Take lamp black purified, eight ounces; indigo, two ounces; ivory black, an ounce; peach stone black, half an ounce; beat all together into a mass, make it into a paste with water in which a little gum arabic has been dissolved, and then form it into long square tablets. Another: Take horse beans, burn them till they are perfectly black, grind them to a fine powder, and with a weak gum arabic water make it into a paste, which form into long square cakes, as before.

WHITES.

Flake White is only white lead in a more refined state, being an oxide or rather carbonate of lead, obtained by exposing the metal to the steam of vinegar.

Zinc White, or Constant White, is formed by the calcination of zinc, by raising it to a red heat in a crucible.

White Lead, or Ceruse, is the corrosion or rust of lead formed by means of vinegar.

Pearl White is the powder of pearls or the finer parts of oyster shells.

Troy White, or Spanish White, is chalk neutralized by the addition of water in which alum is dissolved, and afterwards washed.

Egg Shell White is preferred to flake or troy white. It is made in the following manner: Take off the inner skin of egg shells, then levigate or pound the shells to a proper fineness, and wash over the powder.

Calcined Hartshorn is the earth which makes the basis of horn rendered pure by the action of fire, which separates from it all saline and sulphureous substances. It is of the first degree of whiteness, and not subject to be changed by the air or time.

There are several other pigments used in water colour painting besides those which are here enumerated; but from the above list, the pattern drawer and designer may select what will sufficiently answer their purpose, especially, if the great variety of tints be taken into account, which may be produced by mixing two or more of them together.

For example, a good orange is made by mixing vermilion and gamboge; a sea green, with indigo and sap green; another with indigo and gamboge well ground together; a transparent green, by mixing verdigris and yellow, to various tints, by leaving either predominant; a brown, by mixing sap green and carmine; a lead colour, with indigo and white; a light green, with verditer and gamboge, or with gamboge and verdigris; an olive, with sap green and lake; a lilac, with carmine, Prussian blue and flake white; and so forth.

The greater part of these pigments require to be ground as fine as possible before they are fit for use. This is done on a marble flag with a mullar, adding occasionally a little water, till the mass is brought to the state of fine paste, after which, a little gum arabic water is added. Some dissolve a small bit of refined sugar in the gum water, which prevents the colour from cracking.

After the pigments are ground, it will frequently happen that some of them are still too gross to be used in fine works. To obviate this, mix a quantity of the mass with water in a clean vessel before the gum is added, shake it well, and after it has settled till the grosser parts have fallen to the bottom, pour off the top, and whatever part of the pigment comes over will be as fine as necessary when it is settled, and the water poured off.

Those who desire to know how these pigments are prepared from the original, will find ample satisfaction, by consulting a very valuable work chiefly on this subject, entitled, "*The Handmaid to the Arts*," to which I am indebted for some useful information on this head.

CHOICE OF OBJECTS FOR PATTERNS.

In draw loom patterns, in general, there are usually some principal objects introduced, which are technically termed heads, while the intermediate spaces are filled up with some kind of subordinate members. Hence it is apparent, that the excellence of a pattern will chiefly depend on the tasteful selection and judicious arrangement of these objects, taken as a group.

Those who have paid most attention to the effects of drawing, in general, have uniformly recommended figures bounded with curve lines, in preference to such as are straight, or forming angles. Easy flowing curves and waving lines have always given delight, and still continue to hold a place in the best patterns. So much was Hogarth pleased with the waving or serpentine line, that he termed it the line of beauty; and the spiral line, or that which is represented by the worm of a screw, he denominated the line of grace; and showed, by many instances, how nature delights to employ these lines in the ornamental parts of her works. The serpentine line has long maintained the character given it by Hogarth, and is still introduced into patterns without becoming stale or offensive. The spiral line has likewise its peculiar beauties, which may be traced in the writhes of shells, the ivy round trees, and many other natural productions, which have been also copied, with considerable effect, into different kinds of patterns.

In the choice and arangement of objects, however, for those patterns which are more immediately designed for the draw loom, an imitation of nature has always been recommended as the surest guide to the pattern drawer: not that nature is, in all respects, to be too servilely followed, but that her productions, even in the greatest exuberance of fancy, and in the widest latitude of imagination, may still be kept in view. As the whole vegetable kingdom teems with a profusion of objects, which vary in succession with every season of the year, the pattern-drawer has here an inexhaustible store, from which he can be at all times supplied with ideas. The stalks, leaves, flowers and fruits of vegetables, are more appropriate and becoming for female decoration, than unmeaning groups of grotesque and uncouth objects; and ought therefore to form the basis on which a good pattern is founded. The ideas, however, which are suggested by the different parts of plants, may be varied and compounded in a thousand different ways; yet still the imaginary figures which are thus produced, may have some resemblance to the originals, and be kept within the probability of nature. They ought to excite in us the same surprise and delight which we feel on seeing a rare exotic plant, which, though widely different in its foliage from those which are common amongst us, yet is still recognized to be a genuine production of nature.

Notwithstanding this general appeal to natural productions, there are times and circumstances which frequently give a new character to the style of patterns: such are the Camperdowns, Waterloos, Coronations, &c.; but if these effusions be not founded on a correct and genuine taste, the patterns which are thus introduced will become stale as soon as the effervescence of the moment begins to subside; and the pattern-drawer must again return to natural objects, to refresh and enliven his imagination.

The Chinese and Indian patterns which have been imported into this country, are likewise in some measure exceptions to the easy natural style above recommended; and although they have been long favourites in the market, they still continue to be sought after with avidity, and are imitated to a very considerable extent. But as the genuine patterns of India are often more remarkable for the artificial arrangement of their component parts, than for a brilliant display of colours, it frequently requires no small degree of skill in the pattern-drawer to preserve the peculiarities of their style; without which, the imitations will want much of that exotic appearance which stamps so high a value on the originals.

ARRANGEMENT OF COLOURS.

In the coloured branches of weaving, the distribution or arrangement of colours in a pattern is of no less importance than the choice of objects. Any person who has the least experience in disposing of colours, either in pictures or patterns, will perceive, that some colours will have more brilliancy and effect when placed together, than when they are placed separate, or beside some others. This arises neither from taste nor caprice, but is founded in nature, and may be explained on the principles of optics: for it is well known that the seven prismatic colours have exactly the same relation to each other as the notes in an octave in music; and, therefore, the effect produced by artfully disposing of the kindred colours is no less pleasing to the eye, than the concords of musical sounds are grateful to the ear.

Colours, therefore, with respect to the effect which they thus produce, may be arranged under two heads, namely, those which are contrasting, and those which are harmonizing. The contrasting colours are such as are most opposed to each other; the harmonizing colours are those intermediate tints which lie between the contrasting ones, and as it were blend them together.

The contrasting colours may be discovered by a very simple optical experiment. Place, for example, a red wafer on a sheet of white paper, and look on it steadily for some time till the eye becomes tired, and a ring of green will begin to appear round its edge; and even after the eye has been removed to another part of the paper, the green ring will still be visible. Hence, green is said to be the contrasting, or as it is sometimes termed, the accidental colour of red; as red, on the contrary, is the contrasting colour of green. In like manner it may be found that purple is the contrasting colour of yellow; blue of orange; violet of a mixture of yellow and orange; and black of white.

The compounds of these colours will also have their contrasting and harmonizing ones. Thus, purple inclining to red, has for its contrasting colour, yellow inclining to green; purple inclining to blue, has yellow inclining to orange; and so likewise with the other compounds.

On the other hand, a harmonizing colour will be the nearest tint to the original, but farthest, except the original, from the contrasting colour. Yellow, therefore, is the harmonizing colour of white, orange of yellow, red of orange, violet of red, and blue of violet, &c.

Different shades of the same colour, such as light and dark green, light and dark red, light and dark blue, &c. when they are distant, form, likewise, very bold contrasts; but when the same colour runs through a variety of shades, from a very dark to a very light tint, such tints approach to the nature of harmonizing colours.

In applying these remarks to practice, it will be necessary to recur to a former observation, that there are usually some principal objects introduced into patterns which are called heads, and that the other parts are occupied with some kind of inferior members. These heads, therefore, have generally a reference to the flowers or fruits of plants, while the subordinate objects are meant to represent the stalks, buds, and leaves. By keeping this observation in view, the pattern-drawer will have an extensive field for a display of his judgment and taste, in the selection and arrangement of the harmonizing and contrasting colours; especially if he examines attentively the order in which nature commonly disposes them. Thus, for example, in the centre of a red rose, he will find a yellow tint blended with the orange hue of the stamens, while the petals, or leaves of the flower, are red. These tints, agreeably to the order above-mentioned, are harmonizing colours; while the calyx or cup, which comes in contact with the petals, as well as the other parts of the shrub, are green, the natural contrasting colour of the red. Examples of the contrasting colours in flowers will be found in some species of the violet, the wall-flower, and many other productions of the flower garden.

This account of the arrangement of colours is of the greatest importance at the present time, as that beautiful mixture of shades and tints displayed in the silk manufacture lately imported from France, depends on the theory here laid down.

REED SCALE.

This instrument is of great use in every branch of fancy weaving, particularly in the draw loom department. Fig. 7, Plate 11, is a representation of this instrument adapted to the Scotch standard, which is 37 inches. At A are the number of splits in one inch for each sett in the left hand column. The numbers at B are the nearest setts to these, for the Manchester and Bolton count, which is regulated by the number of beers or porters in 24½ inches; and the nearest corresponding setts of the Stockport count will be found at C, which is estimated by the number of ends or warp threads in an inch. This column also shows, very nearly, the number of weft shots in an inch, when the complete hundreds in the left-hand column are accounted shots on the common web glass for 37 inches. It would have shown them more accurately, had it not been calculated to the nearest even numbers, to adapt it to the setts, or of the Stockport reeds; the scale of which excludes the odd numbers. The divisions at the bottom of the scale are inches.

The construction of the reed scale is very simple, and may be as follows: having drawn the requisite lines for distinguishing the different setts of reeds, find by calculation the length of one porter for each sett, to the hundredth parts of an inch. This may be done by the following proportion: as the porters on ell: 37 inches:: 1: to the length of one porter. Take this in a pair of compasses from a diagonal scale, and set it off from left to right along the space intended for that sett, which will divide it into porters; after which, one porter may be again divided into twenty parts for splits.

In like manner a scale may be constructed for the Manchester and Bolton reeds: for it will be, as the number of beers in 24¼ inches: 24¼:: 1: to the length of a beer, which may be divided either into nineteen or twenty dents, as the manufacturer may find answer his purpose.

The Stockport scale may be constructed by dividing an inch into the number of dents peculiar to the number of each sett, which will always be equal to half the number of the reed.

By comparing these standards or scales together, it will be found that a 1400 Scotch reed, which is the most common sett of harness work, in the cotton manufacture, will be very nearly equivalent to a No. 46 of the Manchester and Bolton count, and to a No. 76 of that of Stockport.

DESIGN, POINT, OR RULE PAPER.

This paper, of which frequent mention has been made in the course of this work, is an impression of a copperplate engraving, consisting entirely of straight lines crossing each other at right angles, the spaces between which representing sometimes the threads of warp and woof in a piece of cloth, and sometimes the simple cords and lashes of a draw loom; without any regard to the number of threads in the mail, or the number of shots on the lash. The paper is again divided into larger squares called designs, which contain various proportions of the smaller spaces, to suit the different purposes to which it is applied.

The varieties of design paper in common use are, 8 by 8, 8 by 9, 8 by 10, 8 by 11, 8 by 12, 8 by 13, 8 by 14, 8 by 20, and 10 by 10; that is, 8 by 8 is even paper, or has 8 small spaces, both by the breadth and depth in each design; 8 by 9, has 8 by the breadth and 9 by the depth, and so of the others. In using these varieties for draw loom patterns, 8 is commonly considered the simples or mails in a design, and the variable numbers 9, 10, 11, &c. the lashes; to adapt the pattern either to the quantity of woof on the ground, or the number of shots on each lash. In some cases, however, the variable figures represent the simple cords, and 8 the lashes; which adds considerably to the number of varieties above specified.

The scale on which design paper is drawn, does not coincide with any particular sett of reed, but appears to have been originally calculated for two designs to the inch; although what we have in the market at present be somewhat below that standard. This small difference has probably arisen from each successive engraver copying from the sheet of his predecessor, which is always less than the plate, on account of its being printed in a damp state and shrinking a little as it dries. Were the design paper, however, drawn accurately to a scale of two designs to the inch, then that kind which has ten spaces in the design would coincide nearly with a 700 reed; for it will be found by the reed scale that there are 19 splits in one inch of that sett; so that the difference would only be one split in twenty. In the same manner it will be found that 8 simples in the design would correspond with a 600 reed; and so of the other varieties.

DESIGNING PATTERNS.

The term designing implies, here, the painting of any pattern on design paper, either directly or from the sketch, preparatory to its being read or lashed on the simple of a draw loom. This species of painting is performed with camel hair pencils, and appropriate pigments selected from the preceding or any other list, reduced, if necessary, to a semi-transparent state, as already mentioned. The pencils should be chosen of a middle size, with a good spring and point, both of which may be discovered by drawing them gently through the mouth, and pressing them on the thumb nail; when, if on being moderately wet, they spring again into their form after being bent, it is a sure indication of these qualities. The points of the pencils too, should be adapted as nearly as possible to the size of the small spaces on the design paper on which they are to be employed, that the designer may be able to fill any individual space with only one touch.

A learner in this department, before he attempts the designing of patterns, should endeavour to acquire a dexterity in filling up these little spaces on the design, whether they run in straight or curved lines; taking care always to fill them exactly, without allowing the paint to spread beyond their boundaries, or leaving any of them broken or imperfect. In this exercise he will find some assistance by consulting Figs. 1 and 2, plate 12; in the former of which he will see how straight lines may be designed, so as to form any given angle with the bottom of the paper; and in the latter, the method of designing circular and elliptic figures, which may be easily applied to the delineation of any other kind of curves. He may next attempt what are termed set objects, such as *a*, *b*, and *c*, Figs. 2 and 3. Of these he will afterwards find it of advantage to produce as great a variety as possible; for such figures will not only be found convenient, on many occasions, to introduce as heads into those draw loom patterns, which are designed without a sketch, but to form a happy diversity of ornament in several of the other branches of fancy weaving. When the learner has made some proficiency in these exercises, he may proceed to the designing of patterns from the sketch; an example for which, on a small scale, will be found in Figs. 4 and 5, which may be copied by means of the trace paper and point, after the manner described, under Paper Spots.

In the designing of draw loom patterns, the first thing to be ascertained is the tye of the harness, or the number of cords in the simple. When the pattern is required for a harness which is already mounted, the tye or number of simple cords is given; but when a new harness is to be constructed for any particular kind of pattern, the quantity of warp requisite for the web must first be determined, together with the number of threads which is destined to each mail. Then, if the warp reduced to splits, be divided by the proposed number of parts, provided they are alike, the quotient will be the number of splits in one part; which when reduced to mails, will give the tye of the harness; or, if the warp be divided by the number of splits intended for one part, the quotient will be the number of parts, or times the pattern is to be repeated in the breadth of the web.

Examples.—Suppose a 1400 split harness containing 112 porters warp, to be tied in twelve parts; then, to find the tye, we have

```
    112 porters.
     20
   ----
12)2240 splits.
   ----
    186  8 over.
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Here, as there is one splitful of warp in the mail, we have 186 for the tye of the harness, and 8 of a remainder, to which a few more may be added for selvages.

Again, Suppose a 1400 damask shawl harness, four threads in the mail, were to be constructed; the quantity of warp being the same as in the last example, and the borders to contain 80 cords each: then, the two borders added together make 160 mails or 320 splits, which deducted from 2240, the number of splits in the warp, leaves 1920 for the body of the shawl. Now if we would have the body parts nearly of the same extent as the borders, we divide the 1920 by 160, the splits in 80 mails, and the quotient, 12, is the number of parts. But, as in this case, there is no remainder for selvages, these must be supplied either by adding the usual allowance to the warp, or making an adequate deduction from the tye of the body.

In making calculations of this kind, however, it must be observed, that for harness ties in general, a number should be selected which contains as many small divisions as possible, that when minute objects are introduced, such as are frequent in the guards and bosoms of shawls, the spaces allotted to these objects may be uniformly of the same size, to prevent the appearance of striping, or as it is usually termed, *roading*, which is sometimes seen in small patterns. Thus, for example, a tye of 80 cords may be divided by the numbers, 2, 4, 5, 8, 10, 16, 20 and 40; and one of 72 cords may be divided by 2, 3, 4, 6, 8, 9, 12, 18, 24 and 36, without leaving a remainder in either case; so that these ties will admit of a considerable variety of small patterns without any irregularity or imperfection. On the contrary, were 82 fixed on for a tye, it would soon be found that this number has no other divisions but 2 and 41; and therefore, were objects to the extent of 8, 10 or 12 cords to be woven in this harness, either some of these objects or their intervening plains would necessarily be a cord larger than the others, and occasion the faultiness above mentioned.

When a pattern is to be designed for any proposed harness, the number of cords are first counted off on the design paper, either from right or left, each space, as formerly mentioned, representing one mail. The number of lashes, which may be variously ascertained, are next counted off from the bottom upwards; each space likewise representing a lash, provided the pattern is to be only one cover; but when there are more covers than one, the number of lashes will be proportionally increased, while the number of spaces will remain the same as for the first or ground cover. The design thus marked off, will give the extent of the pattern in its enlarged or diminished state; for in some cases, the design will be greater, and in others smaller than the cloth size. Then, when there is no sketch of the cloth size given, the extent thus found, both by the mails and lashes, is marked off on a piece of clean paper, on which the pattern is now sketched, and traced on the design paper by means of the trace paper and steel point. It is a pretty common practice, however, particularly when much accuracy is not required, to draw the pattern directly on the design without an intermediate sketch. The several members of the pattern are then filled up with the paint and camel-hair pencil, one colour being, in general, sufficient for one cover; but where there are more covers than one, the different colours are painted on the design in the same order that the weaver is to insert them in the cloth. For some kinds of weaving, such as the several varieties of pressures, seeding, &c. the principal objects in the pattern require to be painted solid; while for others, they must be tweeled, flushed, or diced, agreeably to the nature of the texture to be produced. Examples will be found in Plate 12, Figs. 7, 8, 9, and 10.

The trace paper employed for the sketches in designing is the same as that mentioned under Paper Spots, not the blue trace paper described under the article Sketching in the present section; the former being prepared merely by rubbing black lead on a sheet of writing paper, whereas in the latter, the verditer is mixed with oil, which prevents it from being rubbed out when corrections are necessary.

When sketches of the cloth size are given, they may be easily transferred, in the following manner, either directly to the design paper, or to another sheet, for the purpose of tracing them on. Draw a straight line immediately above, and another at the bottom of the original sketch: do the same at the two sides, making right angles at the four corners. Then, if the number of splits in one design or large square of the design paper be taken in a pair of dividers from the reed scale, for the given sett of reed, and set off round the sketch, and these points be connected by lines drawn from the opposite sides, the sketch will be divided into a number of small squares, corresponding with the larger squares on the design paper. But if the cloth sketch be not drawn exactly for the tye of the harness, it must nevertheless be divided into the same number of squares as it is to occupy of designs, without regarding the number of splits in the design, by which means the same sketch may be adapted to harnesses of different tyes, and still preserve the proportion of all its parts. Should the squares thus formed on the sketch, however, be considered too minute for practice, as would be the case for several kinds of harnesses, the extent of two or three designs may be taken and set off round the pattern, and each of the squares thus formed would be equivalent to four or nine on the design paper. The pattern may now be copied from the original on the new sketch or design, by observing what particular parts or members of it are in any square of the former, and drawing similar parts on a corresponding square of the latter;

and so on till the new sketch be finished. To facilitate this process, however, all the squares of both sketches are numbered in the same order, as well from right to left as at the sides, after the manner represented in Figs. 6 and 9.

These observations will be sufficiently illustrated, by referring to Figs. 6, 7, 8, 9, and 10. Fig. 6 is a cloth sketch for an imitation sprig, drawn for 24 splits of a 1400 reed. Fig. 7 is the same on design paper for a four thread pressure harness, which consequently will occupy twelve mails. It is designed on 8 by 10 paper, and will therefore stand square with between 17 and 18 shots of weft on the ground, and four shots of spotting on each lash. Fig. 8 is the same sprig designed for a three thread pressure harness. In this case it occupies sixteen mails; for, as there are 48 threads in 24 splits, and three threads in each mail, 48 divided by 3 gives 16 for the number of mails. Likewise, as there are four shots on each lash, this design will require nearly 19 shots of weft on the ground, to make it square; for as three threads in the mail are to four shots on the lash; so is 14, the threads of warp on the glass, to $18\frac{2}{3}$; the number of shots on the same extent. Fig. 9 is the design of Fig. 6 for a split, and Fig. 10 the same for a full or one thread harness, and their dimensions are enlarged accordingly. These two designs are adapted to flushing; that is, the spotting warp is not pressed by the leaves to form the sheds, as in the two preceding examples; but the spotting weft is loose or flushed between the small spaces that are marked black on the design, which marks regulate the distances at which it is catched by the harness. It may be farther remarked that Fig. 9 has two shots on each lash, and Fig. 10 only one; and as they are both designed on 8 by 10 paper, the warp and weft will be in the same proportion as in Fig. 7.

This pattern, although woven with different colours of spotting, is said to be only one cover, except the small yellow diamond in the centre, which is termed double shotting, because additional lashes are requisite, wherever the spaces are painted yellow in these designs. On the same principle, when there are three, four, or more colours going at the same time, that part of the pattern is said to be three, four, or more covers; and their respective lashes are all drawn in succession, without any of the ground weft intervening.

The preceding descriptions apply equally to detached figures, robes, flounces, colonnades, diagonals, or allovers of any other kind of which the parts are alike, or are connected to the same simple; but where there are more simples than one, as the borders, corners, and centres of shawls, each simple must have a space allotted for it on the design paper, and its respective part of the pattern designed on it accordingly. Thus, for a shawl pattern with only a body and border, the border part must be counted off at one side of the body, commonly at the right, if for a right hand harness, but on the left, if the contrary. This distinction, however, is the less necessary for the designer, as the flower-lasher can adapt the same pattern to either of these harnesses, merely by changing its position in the frame, and reading it upwards or downwards as the case may require.

Suppose, for example, Fig. 11 to be the plan or pattern of a damask shawl on a small scale, adapted to a tye of 80 and 80; that is, 80 cords for the border, and 80 for the body: then, as these patterns are usually designed on 10 by 8 paper, or 10 simple cords and 8 lashes in each design, 160 spaces are counted off from right to left, namely, eight designs for the border, and other eight for the body. But as the pattern is to be square, the depth must be taken in designs also; and therefore, the same number of designs, viz. sixteen, counted upwards, will give 128 lashes, which must be marked off also. The extent of the guards is next ascertained, and counted off on the design. In this example, ten mails are allowed for each guard, including the two dead lines or simples at 1, 1. Then set off the dimensions of the intermediate space A, between the guards, on a piece of clean paper, on which draw the sketch of the pattern. This is now to be traced on the design paper, first on the space A, for the cross border; after which, turn up the under side of the sketch, on which the outlines of the pattern will be visible from the mark left by the tracer, and lay it over the space B, and again trace it on the design, thus reversed, for the side border. Another sketch is requisite for the corner C, which is traced on in the same manner; after which, all the parts of the pattern are painted as already directed.

If the bosom of the shawl is to be a running pattern, it is sketched and traced on after the manner of an allover; but if it is to consist of detached or set sprigs, as in the present example, equal spaces must be allotted to each, agreeably to the intended size of the objects, or the distance at which they are to stand from each other; taking care always, that the joinings be made perfectly correct; and that the plains, at least when small, be of the same number of cords.

Fig. 12 is the plan of a shawl with a centre and corners, which, for example, may be taken for a 700 four thread Angola, with 48 mails for the border, and 45 for the body, corner, and centre, respectively. The calculation for the several parts will then stand as under.

The two borders, ...	48+48=96
The two corners, ...	45+45=90
The centre gathered, two parts,	45+45=90
	276
For splits, multiply by	2
	552

Suppose 56 porters warp =1120 splits.
Deduct 552

Divide by the body tye, 45)568(12 parts.
45

118
90

28 over, which 28 splits will be sufficient for selvages, and the quotient gives 12 parts for the body, or six between the corner and centre on each side.

In designing patterns for shawls of this description, the parts for the border, corner, body, and centre, must all be marked off on the design paper, and, for a guide to the designer, may be formed into square compartments as represented in the Fig. Then, when the borders have been sketched and designed as directed in the preceding example, a sketch is made for the corner at *a*, and another for the centre at *e*; each commonly forming the quadrant of a circle within the limits of its respective part. When these have been likewise designed, it will remain to finish the filling of the body, which requires some little attention with respect to the different parts where they join. For here it must be observed, that as the lashes are wrought down the simple at one time, and up at another while weaving the corners and centre; and further, that both the corners and centre are gathered; it follows, that no figure but what is alike on all its four sides will suit for a filling: for were sprigs, for instance, introduced for this purpose, their tops would be turned towards each other in some parts of the shawl, and their stalks in others.

It is also to be remarked, that when there is to be only one object in the part; as the diamond in the present instance, it must be placed exactly in the centre of each square or division of the body; for, were this precaution not taken, some of the objects would either be thrown closer together, or farther distant at the turning of the lashes and gatherings of the harness, than in the other parts of the shawl; but when placed in the centre of each part, they will stand clear of the borders, and at equal distances from them all round. When the objects are to be embosomed with others, however, such as the circular figures in the present example, they must be placed at the corners where the several parts join, with the fourth part of the object in each corner of the contiguous squares; so that, wherever four of these corners come in contact, the figure will be completed. All this will be evident by an attentive perusal of Fig. 12.

Sometimes the corners and centre are woven with one simple, which is a considerable saving of the cordage and pulley-box; but when this method is adopted, the corner and centre parts are tied together, and consequently, one half of the centre is woven along with the corners, and the double of the corners along with the centre; the half parts thus formed being termed shoulders. These shoulders are represented in Fig. 12 by the dotted circular lines *i* and *o*, and are merely two quadrants of the centre joined together. In designs of this kind, the centre part is wholly omitted, and no more of the pattern is requisite than the four squares *x*, *y*, *w*, and *z*, for the corners, and filling together with the corresponding parts of the borders; but the same attention is necessary for joining the filling objects as in the last example.

In ascertaining the kind of design paper suitable for any pattern, regard must be had, both to the number of shots on the glass compared with the sett of reed, and the number of shots thrown in on each lash, with respect to the number of threads in the mail. When the number of shots on the lash is equal to the number of threads in the mail, the proportion will be, as the complete hundreds of the sett of reed, or warp threads on the glass : to the shots on the glass :: so is 8, the number of mails in one design common in such cases : to the number of lashes in one design.

For example—Suppose we wish to know the design paper for a 1400 split harness shawl, to count 17 shots on the glass—here, as there are two threads in the mail, and two shots on the lash, we have

14 : 17 :: 8 : 9$\frac{5}{7}$.
8

14)136(9
126

10 = $\frac{5}{7}$

That is 8 by 9$\frac{5}{7}$, the nearest to which is 8 by 10—but if we suppose 17$\frac{1}{2}$ shots on the glass, we will have 8 by 10 exactly, for 14 : 17.5 :: 8 : 10.

When there are more shots on the lash than threads in the mail, there are generally fewer lashes than mails in the design; and therefore 10 is usually taken for the mails. Thus, for a 1400 damask shawl, which has four threads in the mail, and eight shots on the lash, even paper, such as 10 by 10, would give 28 shots on the glass, or double the quantity of the warp. But suppose 22$\frac{1}{2}$ shots on the glass, which makes a pretty fair fabric, then we have this proportion.

14 : 22.5 :: 10
10

14)225(16
14
85
84

1

The answer here is 16, but as the number of shots on the lash is double the number of threads in the mail, we must take only the half of this answer, which is 8; and therefore, 10 by 8, or 10 simple cords for 8 lashes is the proportion required.

When a pattern is to be designed for a given number of shots in an inch, and the ground thicker by the weft than by the warp, which is generally the case; the proportion will be, as the number of warp threads in an inch, to the shots in an inch; so is 8, to the number of lashes in a design.

Example—If a pattern is to be designed for a 1400 reed, to count 100 shots in an inch, what proportion of design paper will it require?

Note—The number of warp threads in an inch may be found by multiplying 5.4, the number of times the web glass is contained in an inch, by the complete hundreds of the reed—thus,

$$\begin{array}{r} 5.4 \\ 14 \\ \hline 216 \\ 54 \\ \hline 75.6 \end{array}$$

That is $75\frac{3}{5}$, or 76 nearly—then say,

$$\begin{array}{l} 76 : 100 :: 8 \\ 8 \\ \hline 76)800(10\frac{1}{2} \\ 76 \\ \hline \ 40 \end{array}$$

Here is 8 for the simples, and somewhat more than $10\frac{1}{2}$ for the lashes; so that either 8 by 10, or 8 by 11 may be taken, according as the manufacturer wishes his cloth of thickness.

Again, a 1600 with 120 shots in an inch, will require 8 by 11; for in a 1600 there are 86 warp threads in an inch—therefore,

$$
\begin{array}{l}
86 : 120 :: 8 : 11 \\
8 \\
\hline
86)960(11 \\
86 \\
\hline
100 \\
86 \\
\hline
14
\end{array}
$$

In designing patterns for gauze harnesses, each splitful of warp counts for a simple cord, while only one shot of weft is equivalent to a lash. One half of the sett of reed therefore must be taken to find the proportion between the mails and lashes in a design.

For example—A 700 gauze harness is commonly woven with from five to six shots on the glass: suppose five shots—then the half of 7, the complete hundreds in the sett is 3½ or 3.5—and

$$
\begin{array}{l}
3.5 : 5 :: 8 \\
8 \\
\hline
3.5)40.0(11 \\
35 \\
\hline
50 \\
35 \\
\hline
15=\frac{3}{7}
\end{array}
$$

So that 8 by 11, or 8 by 12 may be taken in this case, and so of others.

It was formerly noticed, that the number of lashes for the ground or first cover of any pattern might be variously ascertained. For instance, if the patterns be square, as those for allovers, diagonals, &c.; the number of designs in the tye will always be equal to the number of designs in the lashes, whatever be the proportion of the mails to the lashes in a design. But if a pattern be deeper than it is broad, as is commonly the case with the ends of plaids, &c. or broader than deep, as in the cross borders of shawls; then the breadth of the tye taken from the reed scale for the given sett, will be to the depth of the sketch taken from the same scale, as the number of designs in the tye, to the number of designs in the depth of the pattern; or if the sketch be divided into small squares, similar to the large squares of the design paper; then the number of these divisions counted upwards, will give the number of designs that the pattern is deep.

When the pattern is to stand on any given number of inches on the cloth, independent of the depth of the sketch; first find the number of shots on an inch from the number of shots on the glass, if necessary; then multiply them by the inches in the depth of the pattern; divide this product by the number of shots on the lash, and the quotient will be the answer.

For split harness patterns, when small, such as sprigs, cross borders of shawls, &c. five designs of paper that has eight mails in the design, will be sufficiently near for the lashes of one inch of cloth woven in a 1400 reed; whatever number of lashes may be allowed to the design. This arises from the consideration, that five designs of eight mails each, are equal to 40 cords of the simple: but as 38 splits or cords of a 1400 reed are equal to one inch, the difference is only two cords, which, for small objects, as already noticed, will be inconsiderable; consequently, five designs deep will likewise give the same extent by the weft.

For deep patterns, however, such as pine plaids, one twentieth part must be deducted from the number of designs given by the above rule; but the number of designs or lashes may be more readily found by the following table. The left hand columns contain the hundreds of the reeds for the different setts, from 700 to 3200 inclusive; but when the two ciphers are cut off from the right, they exhibit the shots on the glass for their respective setts. In the right hand columns are the shots on an inch, and in the others, the splits contained in the inches and parts of an inch marked along the top.

DESIGNING TABLE.

Hds. reed.	¼ in.	½ in.	¾ in.	1 in.	2 in.	3 in.	4 in.	Sh. on in.
700	5	9	14	19	38	57	76	38
800	5	11	16	22	43	65	86	43
900	6	12	18	24	49	73	97	49
1000	6	13	20	27	54	81	108	54
1100	7	15	22	30	59	89	119	59
1200	8	16	24	32	65	97	130	65
1300	9	17	26	35	70	105	140	70
1400	9	19	28	38	76	113	151	76
1500	10	20	30	41	81	121	162	81
1600	11	21	32	43	86	130	173	86
1700	11	23	34	46	92	138	184	92
1800	12	24	37	49	97	146	195	97
1900	12	25	38	51	103	154	205	103
2000	13	27	40	54	108	162	216	108
2100	14	28	42	57	113	170	227	113
2200	14	29	44	59	119	178	238	119
2300	15	31	46	62	124	186	249	124
2400	16	32	48	65	130	195	259	130
2500	17	33	50	67	135	203	270	135
2600	18	35	52	70	140	211	281	140
2700	18	36	55	73	146	219	292	146
2800	19	38	57	76	151	229	303	151
2900	19	39	59	78	157	235	314	157
3000	20	40	60	81	162	243	324	162
3100	21	42	63	84	168	251	335	167
3200	21	43	65	86	173	259	346	173

DESIGNING TABLE CONTINUED.

Hds. reed.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	11 in.	Sh. on in.
700	95	113	132	151	170	189	208	38
800	108	130	151	173	195	216	238	43
900	122	146	170	195	219	243	267	46
1000	135	162	189	216	243	270	297	54
1100	148	178	208	238	267	297	327	59
1200	162	194	227	259	292	324	357	65
1300	175	211	246	281	316	351	386	70
1400	189	227	265	203	340	378	416	76
1500	202	243	283	324	365	405	446	81
1600	216	259	302	346	389	332	475	86
1700	230	276	322	367	413	459	505	92
1800	243	292	340	389	438	486	535	97
1900	257	308	359	411	462	513	565	103
2000	270	324	378	432	468	540	594	108
2100	284	340	397	454	511	567	624	113
2200	297	357	416	476	535	594	654	119
2300	311	373	435	497	559	622	684	124
2400	324	389	454	519	584	649	713	130
2500	338	405	473	540	608	676	741	135
2600	351	422	492	562	622	703	773	140
2700	365	430	511	584	657	730	803	146
2800	378	454	530	605	681	757	832	151
2900	392	470	546	627	705	784	862	157
3000	406	487	568	649	730	811	892	162
3100	419	503	586	670	754	838	922	167
3200	432	519	605	692	778	865	951	173

DESIGNING TABLE CONTINUED.

Hds. reed.	12 in.	13 in.	14 in.	15 in.	16 in.	17 in.	18 in.	Sh. on in.
700	227	246	265	274	303	322	340	38
800	259	281	303	324	346	367	389	43
900	292	216	340	365	309	413	438	49
1000	324	351	378	405	432	459	486	54
1100	357	386	416	446	476	505	535	59
1200	389	422	454	486	519	551	584	65
1300	421	456	493	527	562	597	632	70
1400	454	492	530	567	605	643	681	76
1500	486	527	567	608	649	689	730	81
1600	518	562	605	648	691	734	778	86
1700	551	597	643	689	735	781	827	92
1800	584	622	681	730	778	827	876	97
1900	616	668	719	770	822	873	924	103
2000	648	702	756	810	864	918	972	108
2100	681	738	794	851	908	965	1021	113
2200	713	773	832	892	951	1011	1070	119
2300	746	808	870	932	995	1057	1119	124
2400	778	843	908	973	1038	1103	1167	130
2500	811	878	946	1013	1081	1149	1216	135
2600	843	913	984	1054	1134	1204	1275	140
2700	876	749	1029	1094	1167	1240	1313	146
2800	908	934	1059	1135	1211	1286	1362	151
2900	940	1019	1097	1176	1254	1332	1411	157
3000	973	1044	1135	1216	1297	1378	1460	162
3100	1005	1089	1173	1257	1340	1424	1508	167
3200	1038	1124	1211	1297	1384	1470	1557	173

may stand directly opposite to that space of the design paper to which it corresponds in the pattern; with allowance for one empty interval of the reed at the end of each design. The pattern is now placed immediately above the reed as represented in the Fig.: and over it the ruler E, which is made to slide up and down in grooves cut in the sides of the frame.

These arrangements being made, and the ruler E fixed above the space of the design paper that represents the first lash, the operator fastens one end of the lash twine round the pin *a*, in such a manner that he can disengage it again at pleasure; then, after counting off such spaces at the left of the design as are to be omitted, if any, he takes a turn of the lash twine round the first parcel of simple cords that are to be taken for the lash, bringing the loop of the twine over the pin *a*, then round the next parcel of cords that are to be taken, and again bringing the loop of the twine over the pin *a;* and so on, alternately, until the lash be completed; taking care at the same time, never to take above six or seven cords into one tack or loop of the twine; for, when a greater number of cords come together, they must be divided into different tacks, not exceeding either of these numbers in each. After the lash has been applied in this manner, the two ends of the lash twine are knotted together, close to the pin *a*, which is now taken out, and the loop that it has formed is twisted round and made into a snitch for the purpose of fastening it to the head. The lash is now pushed down behind the board *m* to make room for another.

For example: Suppose the sprig, Fig. 5, plate 12, were to be read on a simple of 96 cords, and that one row of sprigs were to be thrown into the bosom of the other. Here it is evident, that as this sprig contains 48 cords, which is exactly the half of the simple, the other half will be appropriated to the intervening plains. Then, when the design is placed in the frame and adjusted to the simple, as already mentioned, the lasher, after fastening one end of his twine, counts off 20 cords at the left side of the simple, corresponding with the 20 blank spaces on the first space of the pattern; then takes a turn of the twine round the next two cords and brings the loop over the pin *a;* he again passes 7 cords and takes 9; but as 9 cords are too many for one tack, he divides them into two parcels, or tacks, one of 5 and the other of 4, which he separates by a turn of the twine. The two ends of the twine are now knotted, the pin taken out, the loops twisted, and the lash put over the bar *m*. The other lashes are applied in the same manner till the sprig be finished. The bosom sprig is next read on that half of the simple that was set aside for the plains of the first row; but as the position of the sprigs in these two rows is commonly reversed, the reading must commence at the opposite side of the design, which is done either by taking the tacks from right to left, or by turning the design upside down, and reading downwards.

The small pattern in the frame is the same as Fig. 7, which is given as an example of double shotting on a small scale. For, suppose the lasher had already applied the first seven lashes, which are all adapted to one cover, the ruler E would now be shifted to its present position, which is immediately above the eighth space, in which there are two cords of yellow or double shotting in the centre of the sprig. Then, after applying the red lash for the ground cover, as already directed, he would take another tack for the two cords of yellow, which must be kept as a distinct lash from the other.

Although in these examples the instructions are given to take the painted parts of the design; yet in some cases it is of advantage to the weaver to take the ground simples and pass the flower, especially when the latter is considerably heavier to draw than the former; and in others it is absolutely necessary, as in shawls, for instance, the pattern of the side borders of which are thrown up by the warp and of the cross borders by the weft; for in the one the flower is taken, and in the other the ground.

It may be here observed, that the cross bar or board *m*, in the frame, should be made somewhat circular at the back, that when the simple cords are spread round it, the lashes may be all of an equal length from the simples to the pin *a*. Also, that the cross board *a* should be moveable on the side pieces, so that it may be fixed nearer to, or farther from the board *m*, according to the intended length of the lashes.

SECT. III. APPLICATION OF THE DRAW LOOM.

It has been already observed, that the draw loom must assume different forms, to suit the various branches of fancy weaving in which it is employed. This diversity arises sometimes from the construction of the harness, and sometimes from the mode of opening the flowering sheds. In some draw looms these sheds are opened directly by the harness; in others, by the front leaves, after certain portions of the warp have been raised by the mails. The former of these are either the full, or flushing harnesses; the latter are generally termed pressers, and have always more than one thread in the mail. The pressers, also, may be divided into two kinds, namely, those which incorporate the whole of the weft into the fabric of the cloth, such as the several species of damask; and those which have parts of the spotting weft cut away between the flowers, as in some of the imitations. The general principle however on which the presser harnesses operate, will be easily understood by an explanation of a very simple apparatus called the

DIAPER HARNESS, OR BACK CAAM.

Fig. 4, plate 11, is a side view of this apparatus, adapted to a diaper pattern of five divisions, and woven with a five leafed tweel. 1, 2, 3, 4, 5, are leaves of heddles with mails instead of eyes, and are the substitute for the harness. They are mounted with bow cords as already explained; from each of which a cord passes over a pulley in the box *o*, and extends above the weaver's head to a convenient distance, where it is fastened like the tail of another harness. To each of these tail, or rather simple cords, is tied a knot cord *a*, to which is appended a bob or handle *e*, and is secured by pulling the knot into a notch in the board *u* when drawn by the weaver's hand, as exhibited in Figs. 13 and 16, plate 1. To the under shafts are attached the weights *i*, one at a little distance from each end of the shaft, to sink the leaves when relieved from the notches. 6, 7, 8, 9, 10, are the front or ground leaves, which are equal to one set of a five leafed tweel, and with eyes of a length sufficient to allow the warp to rise in the harness sheds without obstruction.

In each mail of the harness leaves are commonly 4, 5, or more threads, generally one set of the tweel draught, which, in the present example, is five. These threads are again drawn through the front leaves in the order exhibited in Fig. 5; that is, each mailful of the back leaves A is separated and drawn in regular succession through the eyes of the ground leaves B. On the treadles at C is the plan of cording; but here it must be observed, that the ciphers denote raising cords, the crosses sinking ones, and the blank squares the leaves which are stationary when any shed is opened; so that by comparing the plan of cording at C, with the position of the front leaves in Fig 4, it will be found, that when the treadle 1 is pressed down, the back leaf 6 is stationary, the leaf 7 is raised, the leaf 8 is stationary, the leaf 9 is sunk, and the leaf 10 is stationary. Hence it is evident, that when one or more of these back leaves are raised by pulling the bobs, all the warp threads which pass through their mails will be raised to the top of the eyes of the front heddles; and when any treadle, as No. 1 is pressed down, the leaf which is sunk will take along with it one thread out of each mailful which was previously raised, and the leaf that rises will take along with it one thread out of each mailful that remained at the bottom of the shed; consequently, four-fifths of the flower warp, and one-fifth of the ground will be above the shuttle in this shed; which produces exactly the same effect as the turned or reversed tweeling, formerly explained. Now it will appear that by this method of pressing, all the weft, both in the ground and pattern, will be incorporated with the warp; but were one leaf sunk without raising the other, the parts of the weft then thrown in would be flushed over those portions of the warp that were not pressed, which makes the distinction already noticed in the presser harnesses.

By referring back to the process of weaving diaper, it will obviously appear, that this simple apparatus will produce the same effect as twenty-five leaves and as many treadles mounted in the common way. Hence it is, that the back harness or caam is frequently employed for weaving such patterns as are of an intermediate extent, between the power of single leaves and what is properly termed the damask harness. It is also farther to be observed, that as the number of back leaves in these mountings must be exactly the same as those in the binding plans of the patterns for which they are intended, the draught over these leaves will also follow the very same order of succession; and the weaver must likewise pull the bobs or handles in the same order in which he would work over his treadles.

Fig. 12, Plate 4, is a shawl pattern adapted to the back harness. It is one of the gathered kind, the two dark spaces at the left hand being the centre of the border. It requires 36 back or harness leaves, seven for the borders and twenty-nine for the bosom sprigs.

DAMASK.

This beautiful branch of ornamental weaving takes its name from Damascus, where it is said to have been invented.

Silk damasks are manufactured in abundance in several parts of England for ladies' shawls, &c. This branch is also carried to a great extent in the manufacture of table linen, and has also, of late, been introduced into the cotton manufacture with considerable success, in the form of shawls and other kinds of ornamental dresses; which latter are chiefly made for the export trade.

Damask, like the diaper, is merely a branch of fancy tweeling; or rather, it is the principle of diaper weaving conducted on a more extensive scale by means of the draw loom. Damask patterns, therefore, are formed on the cloth merely by reversing the tweel, which is considerably diversified by employing different sets of front leaves, or by varying the arrangement of the raising and sinking cords on the treadles: Some of the most useful plans of which are as follow.

No. 1, 4 leafed. Biassed.					No. 2, 5 leafed. Biassed.						No. 3, 5 leafed. Broken.					
		x	0	1				x	0	1	x	0				1
	x	0		2			x	0		2				x	0	2
x	0			3		x	0			3		x	0			3
0			x	4	x	0				4	0				x	4
4	3	2	1		0				x	5			x	0		5
					5	4	3	2	1		5	4	3	2	1	

No. 4, 6 leafed.
Biassed.

x					0	1
	x			0		2
		x	0			3
		0	x			4
	0			x		5
0					x	6
6	5	4	3	2	1	

No. 5, 6 leafed.
Broken.

		x			0	1
		0		x		2
	x			0		3
	0		x			4
x			0			5
0					x	6
6	5	4	3	2	1	

No. 6, 8 leafed.
Biassed.

x							0	1
	x					0		2
		x			0			3
			x	0				4
			0	x				5
		0			x			6
	0					x		7
0							x	8
8	7	6	5	4	3	2	1	

No. 7, 8 leafed.
Broken.

				0			x	1
		x					0	2
		0			x			3
x					0			4
0			x					5
			0			x		6
	x					0		7
	0			x				8
8	7	6	5	4	3	2	1	

No. 8, 8 leafed.
Broken.

			x				0	1
		0				x		2
	x				0			3
0				x				4
			0				x	5
		x				0		6
	0				x			7
x				0				8
8	7	6	5	4	3	2	1	

No. 9, 8 leafed.
Broken.

0					x			
		x	0					
						0	x	
	0			x				
	x			0				
						x	0	
		0	x					
x					0			
8	7	6	5	4	3	2	1	

Damask for table linens are sometimes woven with a five leafed tweel, and sometimes with one of eight or more leaves. When woven with a five leafed tweel, they are usually denominated bastard damask; and when more than eight leaves are employed, they are called superfine damasks. The eight leafed tweel, therefore, is that which is usually termed the damask tweel.

The number of threads in each mail of these fabrics, is likewise variable, being sometimes three, four, or more, according as the web is intended of fineness. Taking advantage of this circumstance, the damask weaver has seldom use for more than one harness, though he may have occasion to weave different setts of reed; for, by thus varying the number of threads in the mail, and even the number of threads in a split, the number of setts may be considerably increased without either changing the reed or harness: and this plan of economy is still carried farther, where much accuracy is not required, by sometimes drawing a thread more in one mail than in another, and disposing of these additional threads at regular intervals, in the same manner that weavers set their overplus heddles when they are finer than the reed. Damasks, however, when wanted very fine, and much accuracy and delicacy required in the design and shading of the pattern, may be woven in a full harness; but as these require an immense quantity of cordage, and, consequently are so very expensive in mounting, especially when the pattern is large, the full damask harness is not common.

In looms mounted for extensive patterns, considerable economy is also observed by introducing what is termed single and double mounting. In the single mounting every mail in each part has a simple cord to itself, and therefore can be raised independent of any other. The double mounting is merely certain portions of the border, or body gathered; by which means, not only the tail and simple are considerably curtailed, but a vast deal of expenses are saved in drawing and designing these extensive patterns.

For example: Suppose a damask napkin were to be woven, which has 63 porters warp and 5 threads in each mail; then we have

Porters warp, . . .	63
40 threads in one porter mult, .	40
Divide by the threads in a mail,	5)2520
	504 mails.

Now these may be divided into parts, thus,

For one side border, .	9	designs,	single.
For the body, . .	13	do.	double.
Do. . .	6	do.	single.
Do. , .	13	do.	double.
For the other side border, .	9	do.	single.
	50	designs.	
10 mails in a design,	10		
	500	mails.	

which deducted from the given quantity of warp, leaves four mails or ten splits for selvages. Here the designer can draw any pattern he pleases for the borders, to the extent of 9 designs or 90 cords. In the body of the napkin, however, he may draw what he pleases also on the 6 designs in the centre, as that part is single mounting; but it must be such a figure as will join with the 13 designs of double mounting on each side, so as to form the whole pattern into one complete group. The tie of this harness will therefore be 90 cords for the border, 180 double and 60 single for the body; making in whole 28 designs, or 280 cords for the simple.

Patterns for damask tablecloths are designed on 10 by 10 paper, and may be woven square by adapting the number of shots on each lash, to the intended thickness of the cloth. They are generally composed of coats of arms, groups of flowers, landscapes, birds, trees, &c. and are shaded off after the manner of the sprig, Fig. 5, so as to render all the component parts of the pattern perfectly distinct.

Damask harnesses are sometimes mounted for the draw-boy, sometimes on the comb or patent plan, explained already, and sometimes these two principles are united: as, for example, when a coat of arms is woven in the centre of a tablecloth, the borders and part of the body are commonly mounted for the comb, while the part that works the armorial bearings, is adapted to the draw-boy. In large mountings, however, there are frequently two or more simples, and sometimes two or more pulley boxes, which are placed in the most convenient position for the weaver; and when any of the simples are not employed, they are tied up and laid aside until they be wanted in their turn.

It may be further observed, that in weaving damasks in general, when any portion of the simple cords are pulled down to form a flowering shed, these cords must be kept down during the time the weaver throws in the whole number of shots on one lash. To ease the draw-boy of this exertion, he has a small apparatus attached to the side of the loom, called a dog, which, by pressing down a treadle with his foot, he runs a bolt through above the tail cords which are pulled down by the simple, and thus prevents them from recovering their natural position without any further trouble, till it becomes necessary to change the lash.

It is likewise, evident, that as in damask weaving, there is only one leaf raised and another sunk by each treadle, while the others remain stationary, these two leaves will nearly balance each other, and so prevent them from recovering their former position after the weaver has withdrawn his foot from the treadle. To remedy this, a weight is attached to the long and short marches of each leaf, nearly in the same manner as in gauze mountings; so that when any leaf is raised, the weight acts on the short march to sink it, but when sunk, the weight is transferred to the long march, which brings it back to its former position. In high mounted damask looms, however, the weights are attached to the top levers.

The following varieties in the cotton manufacture, are woven on the damask principle, namely, common damask shawls, improperly called dumb flower shawls; Lachores, Bungoes, Waterloos, double damask shawls, (double dumb flowers,) cross Zebras, and Angolas.

THE COMMON DAMASK SHAWL,

which was explained as an example in the article designing, has uniformly four threads in the mail, is woven with an eight-leafed satin tweel, such as Nos. 7, 8, 9, in the preceding list, and with eight shots on the lash. The warp and weft of this class are, for the most part, of different colours.

LACHORES,

imitations of a manufacture of this kind in the province of Hindostan, are damasks striped by the warp, with only one shuttle for the weft. The patterns are made to suit the stripes, although they have frequently borders, and pines on the ends, in the form of scarfs.

BUNGOES,

from Strathbungo, in the vicinity of Glasgow, where they were first made, are Lachores spotted to a certain extent of cover.

DOUBLE DAMASK SHAWLS,

a kind of allover spotted damask, with the spotting weft sometimes flushed over the intervals of the ground, though more frequently incorporated with it on the opposite side from the pattern. They have also four threads in the mail, and are woven with the same tweel as the common damask shawl, though No. 7, in the preceding collection, is commonly preferred. The greater part of these shawls have eight shots of the ground, and eight of the spotting on each lash, though sometimes they have only four of each kind. The two shots of the ground and two of spotting are thrown in alternately; that is, supposing No. 7 to be the draught and cording, there would be two successive shots of the ground, and two of the spotting thrown in on the treadles 1 and 2; two of each on the treadles 3 and 4; and so forth. The first two of these shots, however, are thrown in on the lash, which is drawn first, and the other two on the remaining part of the simple, which is denominated the back lash. To assist the draw-boy in this process, he has the apparatus called the dog, fixed to the lower side rail of the loom. This apparatus consists of a piece of wood rounded and brought to a point at one end, and the other end is nailed to a flat piece of wood at right angles, which is moveable, horizontally, on an iron rod. When, therefore, the simples of any shed are separated from the rest by the lashes, the draw-boy runs the dog between them; and then turns it on its axis toward the floor, which pulls down the simples of the pattern, in which position he holds it till the weaver throws in two shots; then turns it in the contrary direction, which draws down the back part of the simple or back lash, on which the other two shots are thrown in.

Another method of weaving double damasks was some time ago introduced by Mr. William Kyle, Glasgow, on a silk shawl, although it has not yet been adopted in the cotton manufacture. The object of this method is, to display a greater diversity of colouring than can be produced in the present method, without increasing the number of shuttles. For instance, were the ground weft white and the spotting red; then, all the ground could be made white, one part of the pattern red, another part pink, or a mixture of the two wefts raised together; and farther, the reverse side of the mixture could be thrown up in other parts, to increase the variety of shades; which, were the warp also of a different colour, would often have a good effect. This diversity arises merely from the manner in which the lashes are applied; for instead of drawing the back lash, as at present, there must be two lashes for each space of the design paper. For the first of these lashes, the white parts for the ground are missed, the red taken, and the parts for the pink or mixture are missed. For the second lash or red shot, the whites or ground are taken, the red and mixture missed; that is, the mixture is always missed, but when the reverse is wanted, these parts are always taken. The other two are taken and missed alternately.

CANTON CRAPES.

These fabrics are an imitation of a species of silk shawls imported from Canton, the capital of the Province of Guangton in China, and centre of the European trade in that country. These shawls are sometimes woven plain, and sometimes flowered in the draw loom. The plain ones are, for the most part, ornamented with needle work. The grounds are plain texture; but the flowered parts of those woven in the draw loom are tweeled with an eight-leafed satin tweel, the same as on the finer kind of damask. The shawls, robes, &c. manufactured in this country, are commonly woven in an 1800 reed, and have from three to five threads in the heddle, according to the fineness of the silk; and when woven in the draw loom, the greater part have four threads in the mail; though some have been woven in a three thread, and some in a split harness. There are two wefts, very hard twisted, the one twist contrary to the other: so that when the cloth is boiled for a considerable time in soap and water, it assumes the crimped or curled appearance of the common mourning crape. The following plans of cording will show how the ground and pattern of a harness shawl are produced.

No. 10.

	0	x	0		0		0	1
0		0		0	x	0		2
x	0		0		0		0	3
0		0	x	0		0		4
	0		0		0	x	0	5
0	x	0		0		0		6
	0		0	x	0		0	7
0		0		0		0	x	8
8	7	6	5	4	3	2	1	

No. 11.

	x			0	0	0	0	1
0	0	0	0			x		2
x				0	0	0	0	3
0	0	0	0		x			4
			x	0	0	0	0	5
0	0	0	0	x				6
		x		0	0	0	0	7
0	0	0	0				x	8
8	6	4	2	7	5	3	1	

In these plans, the crosses ×, represent sinking cords, and the ciphers raising ones, as in the damask plans of cording. No 1 is the regular or progressive plan of cording, and No. 2 is the same, arranged for the weaver's use.

In the weaving of this species of the draw loom, the lay is so suspended that when it is put back to allow the shuttle to pass, all the warp lies on the race rod; and when the lashes are drawn, the warp which is to form the pattern is raised to the upper part of the long eyes of the heddles; so that when the weaver presses down the treadles, the alternate threads of the ground warp are raised to produce plain texture, and every eighth thread of the flower or pattern warp is sunk to make the tweel, as in the common damask.

CROSS ZEBRAS

are also a kind of double damask, which have their patterns running in stripes across the cloth. The spotting is sometimes flushed between the figures, and sometimes incorporated with the warp.

ANGOLAS.

Those which are woven in the draw loom, are double damasks with a four-leafed tweel, of which No. 1 is a draught and cording. In weaving these, a shot of each of the two wefts is thrown in on the same foot, but the one is thrown in on the fore lash, and the other on the back one.

DOUBLE CLOTH HARNESS.

Having already explained the principle on which double cloth is woven, it only remains here to show how it is extended to the draw loom. Suppose we take a shawl for example, the pattern of which is black, and the ground white: then the warp would be composed of a white and a black thread alternately, and four of these threads, two of each kind, would be drawn through each mail of the harness. Were the texture to be that of a three-leafed tweel; six front leaves, three for the white, and three for the black warps would be necessary; and twelve treadles would be requisite to make the treading alternate. A four-leafed tweel, however, would require eight leaves and only eight treadles. The following plans will show the draughts and cordings of these mountings.

No. 12. THREE-LEAFED TWEEL.

			0		x		x				0	1	White Warp.
	x				0		0		x			2	
	0		x						0		x	3	
		0		x		x				0		1	Black Warp.
				0		0		x				2	
0		x						0		x		3	
12	10	8	6	4	2	11	9	7	5	3	1		

No. 13. FOUR-LEAFED TWEEL.

			x				0	1	White Warp.
			0		x			2	
	x				0			3	
	0						x	4	
		x				0		1	Black Warp.
		0		x				2	
x				0				3	
0						x		4	
8	6	4	2	7	5	3	1		

In weaving these shawls, two shots of white and two of black weft are thrown in alternately; the two former on the fore lash, and the two latter on the back one. By inspecting No. 10, it will appear, that when any part of the warp is raised by the harness, the treadle marked 1 sinks one white leaf and raises another; and, consequently, forms the first white shed perfectly clear of the black; the pattern part of which is above the shuttle, and of the ground, below it. The same is to be observed of the treadle marked 2. The back lash reverses the harness shed, by raising the ground and sinking the pattern. The treadles 3 and 4, therefore open the two black sheds, by raising each one leaf and sinking another. The four-leafed tweel operates exactly in the same manner.

Carpets were formerly woven on the principle here explained; but are now generally woven with a machine invented or improved by a Mr. Morton of Kilmarnock, which entirely supersedes the use of a draw-boy. This machine consists of a large cylinder placed above the loom, with the lifts of the harness, agreeably to the pattern, formed on its cylindric surface, by means of nobs and staples made of wire, after the manner that a tune is pricked on the barrel of an organ. These staples act on levers, which throw the simples, or rather tail cords, on each of which there is a knot, into the teeth of two combs, one for each warp, alternately; and the sheds are opened directly by the harness, by means of the treadles.

The double cloth harness is also employed in weaving Marseille bed-covers; which, as it is merely an extension of those mountings explained under the head Double Cloth, will require no farther consideration.

IMITATIONS.

The second kind of presser harnesses mentioned in the beginning of this section, are chiefly employed in weaving imitation shawls, trimmings, scarfs, plaids and zebras, They have sometimes two, three, or four threads in the mail, and commonly the same number of shots on the lash, respectively. The grounds are woven with a four-leafed tweel; though the pattern has sometimes one of four, sometimes one of eight, and sometimes even one of twelve. The following plans will show the principal tweels which are woven on these fabrics.

No. 14.

			x	x	0	0	x	1
		x		0	0	x	x	2
	x			0	x	x	0	3
x				x	x	0	0	4
4	3	2	1	4	3	2	1	

No. 15.

	x			x	x	x	0	1
		x		0	x	x	x	2
			x	x	0	x	x	3
x				x	x	0	x	4
4	3	2	1	4	3	2	1	5

No. 16.

					x			x	x	0	0	x	1
			x			x			0	0	x	x	2
	x			x					0	x	x	0	3
		x					x		x	x	0	0	4
		t		t		t		t					
		4		3		2		1	4	3	2	1	

No. 17.

		x		0		x		0		0	x	x		0		x	1
		0		x		0	x	x		0		x		0		x	2
		0		x		0		x	x	x		0		x		0	3
		x		0	x	x		0		x		0		x		0	4
		x		0		x		0		0		x		0	x	x	5
		0	x	x		0		x		0		x		0		x	6
		0		x		0		x		x		0	x	x		0	7
	x	x		0		x		0		x		0		x		0	8
		t		t		t		t		t		t		t		t	
		8		6		4		2		7		5		3		1	

No. 18.

	x	x		0		x		0		x		x		x		x	1
		x		x		x		x		0	x	x		0		x	2
		0		x		0	x	x		x		x		x		x	3
		x		x		x		x	x	x		0		x		0	4
		x		0	x	x		0		x		x		x		x	5
		x		x		x		x		0		x		0	x	x	6
		0	x	x		0		x		x		x		x		x	7
		x		x		x		x		x		0	x	x		0	8
		t		t		t		t		t		t		t		t	
		8		6		4		2		7		5		3		1	

No. 19.

					x	0	0	x	9 5 1
					0	0	x	x	10 6 2.
					0	x	x	0	11 . 7 3 .
					x	x	0	0	12 . 8. 4 .
				x					. . . 1
			x						. . 4
		x							. 7
	x								10
	4	3	2	1	4	3	2	1	

No. 20.

					x			0	1
	x			0					2
						0	x		3
		0	x						4
	8	6	4	2	7	5	3	1	

The purposes to which these cordings are applied, are as follow:—

No. 14 is for cotton, silk or worsted; the ground equal on both sides.

No. 15 is for a silk warp with cotton weft, the weft thrown to the wrong side of the cloth, that the silk warp may appear to more advantage on the right.

No. 16 has the tongues marked *t* attached to the spotting treadles, for the purpose of throwing in silk or worsted on the back lash, while the ground weft is cotton. When the spotting is thrown in, the treadle only is sunk, but when the back lash is drawn, the weaver shifts forward his foot, and presses down both tongue and treadle.

No. 17 is an eight-leafed tweel for spotting a plaid or shawl, while the ground is a tweel of only four leaves. When the ground shot is thrown in, the weaver sinks both the tongue and treadle; but for the spotting, the treadle only is sunk.

No. 18 is a tweel of the same kind as No 17, but throws the weft to the wrong side, that a silk warp may appear on the right.

No. 19 is a plan of a four-leafed tweel for the ground, and a twelve-leafed tweel or flush for the spotting. Each of the threads, 1, 4, 7, 10, is drawn through two heddles, which are marked on their respective leaves in the plan.

No. 20 is for weaving two shots of ground, and two of spotting, alternately.

Sometimes imitation shawls, trimmings, scarfs, and plaids, are woven without pressing; in which case the spotting is thrown into the shed opened directly by the harness; and wherever the spotting would be too far flushed, it is catched by the harness, as pointed out by the design, in the manner exhibited in Fig. 9, Plate 12.

THE COMMON HARNESS

operates on the same principle as the common spot, explained in chap. 8. The right hand thread of each splitful of warp is drawn into a mail, or rather an eye of the harness, and the other is taken through on the left side of it; and both threads are again drawn through a set of heddles with long eyes in the front, for weaving the ground. The spotting sheds are, therefore, opened directly by the harness; and there are two shots of the ground, which is generally the plain texture, thrown in for one of spotting. This harness was formerly much used for spotted lawns, but it is now chiefly employed in weaving patterns which are formed with cotton rove.

THE PAPER HARNESS

is also an extension of the paper spots. It is therefore evident, that the paper harness will be double of that described above; or, in other words, it will consist of two such harnesses, the one being placed in front of the other; and the first thread of a split is drawn through the eye of the back harness, and the other through the eye of the fore harness, alternately. It has also a set of plain leaves with long-eyed heddles in the front, for weaving the ground. But this harness has now given way to what is usually termed

THE FULL HARNESS.

This harness is, in effect, the same as the preceding, only the threads of warp, instead of being drawn alternately on the back and fore parts, are here drawn straight over the harness, in the manner of an over and over tweel. It is employed in various branches of weaving, wherever much delicacy of pattern is required.

THE GAUZE HARNESS,

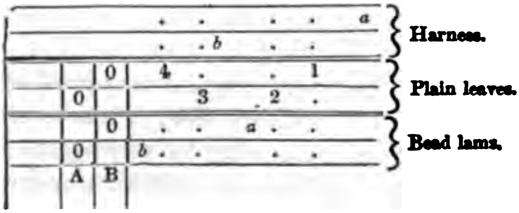
like that of the common spot, contains only one-half of the warp, the other half being taken through between the eyes. In front is a set of gauze mounting for weaving the ground, and having two back standards; as explained in spot weaving.

After the warp is taken through the harness, that is to say, one thread through an eye and the other past it on the left, the whole is taken through the front mounting as formerly described; that thread which passes through the eye of the harness being taken into the upper doup, and the other into the under one. Hence, in forming the spotting sheds by the harness, a treadle must be pressed down, which will raise the back standard, through the under part of which the threads of warp pass, and also the backmost leaf of the back set, which has also the same threads through below its clasps; the others being all sunk, as explained in spot weaving. In working these patterns, in general, one shot of ground and one of spotting are thrown in alternately; although in some patterns there are two shots of the ground for one of the spotting.

TURKEY GAUZE HARNESS.

There have been various methods invented, at different times by ingenious tradesmen, for facilitating the process of weaving Turkey gauze in the draw loom, and improving the quality of the cloth. The three following plans, however, are selected, as having been found to answer fully these important ends, leaving to the intelligent tradesman to judge of their respective merits. The first is quoted from the Renfrewshire Chronicle of April 7th, 1825, under the title of, "Improvement in Turkey Gauze Weaving," and which is given in the writer's own words.

No. 21. PLAN OF THE MOUNTING.

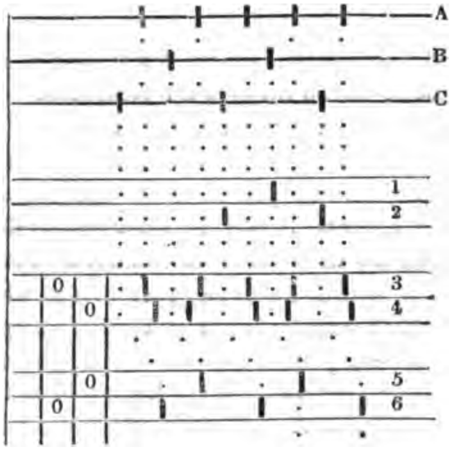


The figures, 1, 2, 3, 4, in the foregoing scheme, show the order in which the ground warp is drawn on the plain leaves. The letters *a*, *b*, on the upper spaces, show where the first two threads of whip are drawn through the harness; and the same letters on the lower spaces, show where these threads are taken through the bead lams. The thread *a*, crossing under the ground threads 1, 2, and the thread *b*, under the threads 3, 4. It is scarcely necessary to add, that these crossings take place after having passed the plain leaves. The harness, it will be observed, is divided into two parts, and the whip drawn alternately on each. When the treadle A is pressed down, part of the whip passing through the back harness is drawn up to form gauze; and when B is pressed, part of that in the fore harness is drawn up for the same purpose. Were the whole of the harness drawn alternately, as A or B is pressed, the whole fabric would be gauze; and, when the treadles are used without the harness, the whole is plain cloth.

Perhaps some further improvement may be made; but it appears, that in every previous attempt to produce the desired effect, so many obstacles presented themselves, that all the plans were soon thrown aside. One thing is certain, that Robert M'Gown, Weaver, Back Sneddon Street, who introduced the above, has produced a considerable quantity of cloth by his method, and that, too, from materials which several operatives declare incapable of being woven on the old plan.

The second method was mounted and woven in Paisley, in the year 1800, by Mr. Charles Allardyce, now foreman in Glasgow. The plan of his mounting is as follows:—

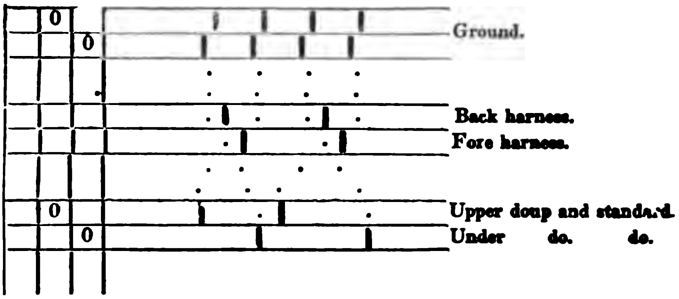
No. 22.



In this plan, the three lines marked A, B, C, represent three rolls; A, the ground roll, B, the back whip roll, and C the fore whip roll. The spaces 1, 2, are the back and fore barnesses respectively; 3, 4, two ground leaves, and 5, 6, two under doups and standards, the same as explained in cross weaving. When the harness is raised it makes gauze, and those parts which are not raised by the harness, are plain texture. When the doup and standard 5 are raised, the doup 6 is slack, and when the doup and standard 6 are raised, the doup of 5 is slack. All this will be easily understood by referring to the process of weaving common gauze, by omitting the upper doup and standard. It is necessary, however, to notice, that the harness is mounted so low, that the whip lies on the race rod when not raised by the harness or standards.

The third method was invented about the same time as the preceding, by Mr. William Kyle, now in Glasgow, of which the following is his plan:—

No. 23.



What is raised by the back harness makes plain cloth, and what is raised by the fore harness, produces gauze. To make the whole gauze, sink the back, and raise the fore harness. The harness is drawn every second shot, when the left treadle is sunk.

SEEDING HARNESS.

When the harness was first applied to seeding, it was so much encumbered with small bobbins for the seeding warp, one for each thread, that patterns of great extent were almost impracticable. This, however, is now obviated by beaming such parts of the seeding warp as work nearly equal, on one roll, and the other parts on others, and suspending a piece of lead to each thread between the mounting and the yarn roll; the slack parts being drawn in at the face of the cloth, when necessary, at the end of a piece. The leads thus suspended are regulated by a hole-board, placed below the loom.

Thus, for example, in a shawl pattern, the seeding warp of the side borders is beamed on one roll, that part which forms the bosom sprigs on another, and the part in the plain spaces between the sprigs, which is cut away when the cross borders are finished, on a third. The principal care, therefore, which is necessary in designing these patterns, is to have them regularly covered, without hurting the figures, that the seeding warp may be wrought up as equally as possible.

The harness, in this species of weaving, is placed before the ground leaves; and as the seeding threads pass through the harness above the clasp, neither eyes nor mails are necessary.

BROCADE HARNESS.

The most common kind of brocades were explained under the article Paper Spots. There is another kind of brocading in the cotton manufacture, however, which is a species of spotting woven in a full harness, that rises above the ground in such a manner, as very much to resemble that kind of needle-work called satin stitch. Patterns of this description are so designed, that the harness raises only a few threads round the edge of the figures when they are small, or divides them into separate members when large; and therefore, all the spotting, which is commonly cotton rove, is thrown to the right side of the cloth.

These patterns are generally woven with an apparatus called circles, from the pirns or bobbins which contain the spotting weft moving in a circular direction, so that each spot, which has its own spotting thread, is bounded with a neat selvage.

SARCENET FLUSH.

Fig. 14 is the pattern of a silk flush, or spotted sarcenet, which is a combination of flushing, tweeling, and plain texture. Fig. 15, shows how the same is put on design paper. It requires a full harness, and the tweeling of the ground, as well as the shading of the figure, must be represented on the design paper. If therefore, the warp of this web be supposed white, and the weft purple, the ground, which is that of a regular tweel, will be chiefly white, the two large buds which are dark shaded, will be purple, and are formed by flushing the weft over the warp: the four buds on the top are woven by reversing the tweel of the ground; the intermediate space, which is cross shaded, is plain cloth, and the centre, which is white, is flushed by raising that portion of the warp.

Having explained the general principles of weaving, both as performed by leaves and the draw loom, agreeably to the practice of this country, I shall conclude this chapter with an extract from Mr. Moorecroft's Letters from India, on the Shawl Trade.

" The shawl merchants admire the ingenuity of the English artists in imitating Cashmere shawls, but condemn the cloth on account of its harshness, which may consist in a difference in the twisting of the yarn. In the shawl country, there are three coloured wools, white, light brown, and dark brown. The two last are from Thibet, the other from Bholkera. The light brown will receive four colours, viz. black, blue, green, and brown. The dark brown will receive only black, brown, and blue. The shawl merchants state that the colours in the English shawls are fugitive. The colours now used do not exceed fifty in the most elaborate productions of the Cashmere loom. Formerly it was said that three hundred and forty shades of colour were used.

"The embroidery is not worked with the needle, but woven in the cloth. The patterns are read off from a book, and not from a drawing. There is an embroidery language or cipher, by which the colours, number, division, distribution, and manipulations of the threads, and the forms and size of the flowers and foliage, &c. are symbolically designated. The looseness of twist in the web is owing to being done by the hand."

New method of Figuring Shaded Silks.—A new method of figuring shaded silks has just (January, 1827) been introduced from France, which is likely to give a pleasing diversity to this branch of manufacture. The figure is produced by a peculiar construction of the reed, and a vertical motion given it by the weaver's feet. The reed is made in alternate spaces, varying in fineness from one rib to the other; for example, from a 1000 to a 2000 reed; but those spaces which are of the fineness of a 1000 reed, in one side or rib, are of the fineness of a 2000 reed, in the other side or rib; the splits or dents standing obliquely, as represented at Fig. 10. plate 13. The machine in which these reeds are made is so constructed, that two turns of the wooping are taken round the rib between the splits in the coarser spaces, and only one turn where they are finer. The reed is about seven inches deep between the ribs; and, as already observed, has a vertical motion given to it in the lay, by means of a rack or other adequate apparatus, communicating with the treadles by cords; and consequently, where the finer parts of the reed come in contact with the face of the cloth, the warp becomes condensed, and shows much deeper in colour: and the effect is the reverse, where the coarser parts of the reed strike the cloth. In other words, when the centre of the reed *a a*, Fig. 10. plate 13, strikes the cloth, the fabric will be uniform; but when it is raised till the line *c c*, for example, comes in contact with the cloth, the spaces marked 2000 will be finer in proportion as the line *c c* approaches the under rib, and those marked 1000 so much coarser than the medium sett; and when the reed is sunk till the line *b b* strikes the cloth, the effect will be the reverse; so that by gradually raising and sinking the reed alternately, the threads of warp will assume the waved appearance represented in Fig. 11. plate 13. It is evident, however, that this figure is woven by a uniform motion of the reed up and down in the lay; but were the motion of the reed varied, which might be effected by a rack and spring shifted by the weaver's hand, as in weaving lappets, a proportionate diversity of patterns would be produced; and probably an apparatus similar to the lappet wheel might be applied with advantage.

CHENEILLE SHAWLS.

This beautiful specimen of our shawl manufacture is the invention of Mr Alexander Buchanan, foreman in Paisley, who has likewise contributed to enrich our manufactures with several other useful improvements. So much did the novel appearance of these shawls attract the notice of his townsmen, that, by a respectable recommendation to the Board of Trustees in Edinburgh, they awarded him the sum of twenty guineas for his ingenuity.

These shawls, which have also been denominated Kamschatkas, derive their beauty and lustre from the peculiar mode of preparing the weft, and the ingenious manner in which the colours are afterwards arranged: in so much, that a pattern which would require a large harness as an imitation shawl, can be woven without any other apparatus than the ground mounting and two treadle feet. The weft, which is called Cheneille, is prepared as follows:—A Turkey gauze warp, of net yarn, is woven in a 1200 reed, with a twist or splitful in every fifth interval, the weft being either silk, cotton, or worsted, according to the kind of shawls to be manufactured. When this fabric comes from the loom, it is cut up by a machine, in the centre between the splitfuls of warp; and, after receiving a little twist, to throw the ends of the cut weft into a spiral direction, it is ready for the weaver. The warp of the shawl is likewise a Turkey gause, the same as that which is the foundation of the weft; so that, when a sufficient quantity of Cheneille has been produced from a warp, it is customary to make shawls of the remainder.

In weaving these shawls, one shot of the Cheneille is thrown in, and three of common weft, whether silk, cotton, or worsted; and the fibres of the Cheneille, projecting in all directions, gives the fabric the appearance of a fine glossy shag, showing the pattern, when figured, alike on both sides.

When the shawls are to be of one uniform colour, only one kind of weft is necessary; but when they are to be figured, different colours are employed; and these are woven in spaces adapted to the different parts of the design. The pattern is first painted on design paper, and coloured as for an imitation harness. Each space of the design, or that which corresponds to a ground lash with its different covers, is again painted on a separate slip of design paper, but two spaces are here covered to make them better seen by the weaver, leaving a blank space on each side. These slips are all numbered to prevent confusion. Suppose, then, a web of trimmings were to be woven, with eight repeats in the breadth of a yard; for the first shot of Cheneille we take the slip of paper, No. 1, and find that, by reading it as for a sample, there are 2 spaces yellow, 1 white, 4 red, 2 yellow, 1 black, 2 white &c. the weaver works a space of each of these colours on the warp, agreeably to its respective size on the slip of design paper; which, when finished, must be exactly the breadth of the trimming. For a guide to the weaver, the slip of paper passes through the reed, and fastened at each end to a piece of tape by a bit of rosin, the one behind the mounting hanging over the warp roll and kept tight by a small weight, and the other fastened at the face of the cloth. The weaver then has only to change his shuttles by shifting the boxes of the lay at the end of each coloured space, as pointed out by the design. The slip marked No 2, is next put into the reed for the second shot, and the colours woven in the same manner, but in the reverse order of the first, as the one is thrown in from the right hand and the other from the left; and so on till the weft for the whole pattern is finished. The weft is cut in lengths of eight yards, being the quantity usually wound on one pirn; and this will make eight shots of a yard wide web, and the pirns are taken in succession, agreeably to the numbers of the slips of design paper, and the colours are placed in the manner formerly done in setting the weft of clouding. This species of weaving is likewise well adapted to the rug and carpet manufacture.

As every exertion has been made, in the course of this work, to trace the late improvements in weaving to their genuine source, it is but doing justice to Mr Robert Paterson, in the employ of Mr William Wylie, manufacturer, Paisley, to state, from authentic authority, that he was the first who produced the new method of weaving shaded silks by a moveable reed in Paisley, described in page 396, and that they were manufactured by Mr Wylie in the month of August, 1826.

The Binder will place this leaf before Chap. XII.

CHAP. XII.

WEAVING BY POWER.

As weaving by power has of late been carried to a great extent, not only in Britain, but on the continents of Europe and America, and forms, at present, a very prominent feature in the cotton manufacture, some account of the processes by which it is conducted will not, it is presumed, be found inconsistent with the general plan of this work.

In a power loom factory, the first process is winding the warp on bobbins from the cope. This is done by a winding machine, as in other manufactories, with this exception only, that the one is driven by power, and the other by the winder's foot. The warp is next prepared for the dressing machine, of which there are two kinds in common use; one, in which the brushes are wrought by cranks, and the other, in which they are circular. The warp is prepared for the crank machine, by winding it from the bobbins on reels, and is commonly divided into five parts; which five parts united form half of the warp; the other half being wound on another reel, and placed at the opposite end of the machine: when, after they are dressed, they are united in the yarn roll in the centre.

The warp for the machine with circular brushes, is wound from the bobbins on four rolls, one-fourth on each; and these rolls are placed in the machine at 1, 1, 1, 1, Fig. 5. So that, when the warp is dressed, the whole is united on the warp roll of the loom at *x*. These rolls contain, com monly, the length of 24 webs, of eight pieces each: and as the pieces are about 25 yards in length, there will be 24 × 8 × 25 = 4,800 yards of warp wound on each roll at one time. The rolls have flanges at the selvages to prevent the warp from spreading.

Fig. 5, plate 14, is a front view of a dressing machine with circular brushes:—1, 1, 1, 1, are the four warp rolls, which are kept in a proper state of tension by the weight *w*:—2, 2, 2, 2, 2, 2, are reeds, and 3, 3, 3, 3, are rods for separating the warp threads in the process of dressing:—*a*, *a*, *a*, *a*, are the circular brushes, and *z*, *z*, *z*, *z*, are other brushes for clearing off the dressing and loose fibres brushed from the warp:—*o*, *o*, are fans, and *u* is a stove, which are employed occasionally for drying the warp:—*x* is the yarn roll of the loom, which receives the warp as it is dressed. Above the rollers *i*, *i*, are others which press upon them and regulate the quantity of dressing necessary for the process. On the frame *b* is a set of plain heddles for forming a lease; and at *d*, a reed for clearing the warp as it proceeds to the roll.

The motion is communicated to the machine by means of the fast and loose pulleys *m*, on the opposite side of the machine, which are fixed on the axle of the bevel wheel *n*; and this wheel gives motion to the shaft *p*, on which there is a triple speed for adapting the motion to the yarn roll *x*, as its diameter is increased by the warp. The shaft *p*, likewise drives the circular brushes *a*, *a*, *a*, *a*, as represented in the Fig. The fans *o*, *o*, for drying the warp, have pulleys on the opposite ends of their axles, communicating with the fast and loose pulleys, by which they are put in motion.

When the fans, however, are not sufficiently powerful, a quantity of steam is introduced into the stove *u*, by means of a stop cock.

Fig. 6, plate 14, is a front elevation, and Fig. 7, a profile of a power loom. In Fig. 6, A is the cloth, B the boxes of the lay, *o o* the drivers, *c* the swords of the lay, D the heddles, *n* the reed, *a* the fast and loose pulleys, and *i* the spring, for putting on and taking off the power:—1, 2, 3, 4, are the ends of four treadles, two for opening the sheds, and two for driving the shuttle:——*w*, the driving pin attached to the pulley *z*, over which there is a belt, the cords of which are attached to the two outward treadles 1 and 4:—*x*, *x*, are the wipers, and *y* the driving cord. In Fig. 7, *a* is the yarn or warp roll, *b* the rods for preserving the lease, A the box of the lay, *c* two pair of temples for keeping the cloth stretched, B a spur wheel on the axle of the cloth roll, and which assists in winding up the cloth. D are the fast and loose pulleys, represented at *a*, Fig. 6, on the axle of which is the spur wheel *i*. The reciprocating motion of the lay A, is given by means of the rod *e*, which connects it to the rim of this wheel. There is a similar rod on the opposite side of the loom attached to a crank. The wheel *C* is driven by the wheel *i*, which, by its revolutions, drives the wipers *v*, *v*, fixed on its axles. These wipers act by their circumferences on the treadles 2, 3; and, as they are circular at their greatest distance from the centres, the motion of the heddles is thereby suspended while the shuttle is passing through the warp. On the outside of each wiper is fixed a circular knob, moveable on its axis, and on the shuttle treadles, 1, 4, are fixed the friction rollers *n*. When, therefore, these knobs strike the friction rollers, they give motion to the shuttle by means of the driving stick *w*, and cord *y*, Fig. 6. It must be observed, however, that the knobs are so fixed to their respective wipers, that the sheds may be fully opened before the shuttle receives its impulse. This is done by shifting them backward or forward in grooves cut in the wipers for this purpose. B and *j* are the wheels for winding up the cloth. The spur wheel B, is driven by a pinion on the axle of the ratchet wheel *j*, and this last wheel is turned round by a catch attached to the top of the lever *x*. This lever has a reciprocating motion given by a stud in the sword of the lay at *s*, Fig. 6. As this catch is moved by every stroke of the lay, it cannot command a tooth of the ratchet wheel at each shot, but reciprocates over one tooth till as much cloth is woven as allow it to take hold of another; the other two catches, represented in the Fig. taking hold of other teeth alternately.

The apparatus which stops the loom when the shuttle meets with any obstruction, is next to be considered. Along the back of the lay A, Fig. 7, runs an iron rod, connected to a spring *g* at each end. This rod is also connected to two circular pieces of wood, one in each box of the lay; so that when the shuttle goes into the box, this piece of wood is driven back, and acts upon the rod so as to raise a small plate of iron which covers a circular hole in the centre of the lay. When, therefore, the lay and shuttle are in operation, the iron plate is raised at each shot, and permits the stud *h* to pass through without obstruction. But when the shuttle flies out of the shed, the iron plate covers the hole and strikes with force against the stud *h*, which is connected with the disengaging rod, and throws the belt off the fast to the loose pulley, which stops the loom.

CHAP. XIII.

CALCULATIONS AND TABLES

CONNECTED WITH THE ART OF WEAVING.

SECT. I. OF GRISTING OR SORTING YARN, &c

The most common substances from which cloths, in general, are manufactured in this country, are flax, cotton, wool and silk. Hemp, which in its nature has a very close analogy to flax, is also manufactured into cloth. It is only the finer kinds, however, which are employed for this purpose, the coarser sorts being chiefly appropriated to the making of cordage. Hair is also spun and woven into cloth; but when it is introduced as weft, in the unspun state, along with flaxen or linen warp, it forms a cloth which is extensively employed for covering the seats of chairs, sofas, &c. There is a breed of goats in the neighbourhood of Angora, a town of Natolia, in Asiatic Turkey, whose hair, which is almost as soft as silk, is also spun and woven into cloth. The finest kind is retained for the use of the Grand Seignor, the remainder being exported into Holland, France, and England, where it is manufactured into camblets and other fine stuffs. The true oriental camblets, however, are only made purely of this material; the European camblets having it mixed with wool or silk, and sometimes with both.

LINEN YARN.

The yarn spun from flax, usually denominated linen yarn, is, by Act of Parliament, to be reeled on a ten quarter, or 90 inch reel, and tied up into cuts of 120 threads or rounds of the reel; and 48 of these cuts to make a spyndle. By this enactment, the eleven and twelve quarter reels, though formerly much used in Scotland, are now entirely laid aside. The spyndle of linen yarn, however, admits of other subdivisions than the preceding, which, with the quantity contained in each, are exhibited in the following

TABLE.

2½ yards = 1 split, one ell, or 45 inches long.
50 = 20 = 1 porter or heer.
300 = 120 = 6 = 1 cut.
600 = 240 = 12 = 2 = 1 heer.
3600 = 1440 = 72 = 12 = 6 = 1 slip or hank.
7200 = 2880 = 144 = 24 = 12 = 2 = 1 hesp.
14400 = 5760 = 288 = 48 = 24 = 4 = 2 = 1 spyndle.

The grist or fineness of linen yarn is commonly estimated by the weight of a spyndle, hesp, or hank; sometimes by the number of heers in the Avoirdupois pound; in some places of Scotland, by the number of heers in the Tron pound; and sometimes its grist is vaguely expressed by the number of hanks in the Avoirdupois pound; as five hank yarn, six hank yarn, &c.

When yarn is gristed by the number of heers in the pound Avoirdupois, it may be reduced to the weight of the spyndle, by the following proportion: As the heers in one pound: to the heers in one spyndle, viz. 24:: so the ounces in one pound, viz. 16: to the ounces in one spyndle. But 24 and 16, which are the mean terms of the proportion, are both constant quantities; their product, therefore, which is 384, divided by the heers in a pound, gives the weight of a spyndle; or divided by the weight of a spyndle, gives the heers in a pound.

Example 1. What is the weight of a spyndle of yarn, of which there are 46 heers in the pound?

here 46)384(8 oz. $5\frac{1}{2}$ drs. answer.
368
16
16 drs.
96
16
46)256(5
230
$\frac{26}{46}=\frac{13}{23}$ or $\frac{1}{2}$ nearly.

2. If a spyndle of yarn weigh 6 oz. how many heers in the pound?

6)384
64 heers, Answer.

3. What is the weight of a spyndle of 6 hank yarn?

In 6 hanks there are 36 heers,

$$\text{therefore, } 36)384(10\tfrac{2}{3}\text{ oz.}$$
$$\underline{36}$$
$$\frac{24}{36}=\tfrac{2}{3}.$$

When linen yarn is gristed by the number of heers in the Tron pound, the number of ounces customary in the place referred to must be known, and substituted for 16 in these examples, which will give the answers required.

Table 1. shows, by inspection, the weight of a spyndle corresponding to any number of heers in the pound Avoirdupois, to drams and tenth parts. For example, on a line with 65 heers in the left hand column there is 5 oz. 14.5 drs. or 5 oz. 14½ drams; and in the third column will be found 2 spyndles and 17 heers in the pound.

TABLE I.

OF LINEN YARN. NO. 1 and 2.

Hrs.	Weight of a Spyndle.		Spyndles & Heers in a lb.		Hrs.	Weight of a Spyndle.		Spyndles & Heers in a lb.	
	oz.	drs.				oz.	drs.		
6	64		0	6	38	10	1.7	1	14
6½	59	1.2	0	6½	39	9	13.5	1	15
7	54	13.7	0	7	40	9	9.6	1	16
7½	51	3.2	0	7½	41	9	5.9	1	17
8	48	0.	0	8	42	9	2.3	1	18
8½	45	2.8	0	8½	43	8	14.9	1	19
9	42	10.6	0	9	44	8	11.6	1	20
9½	40	6.7	0	9½	45	8	8.5	1	21
10	38	6.4	0	10	46	8	5.5	1	22
10½	36	9.1	0	10½	47	8	2.7	1	23
11	34	14.5	0	11	48	8	0.	2	0
11½	33	6.2	0	11½	49	7	13.4	2	1
12	32	0.	0	12	50	7	10.8	2	2
13	29	8.6	0	13	51	7	8.4	2	3
14	27	6.8	0	14	52	7	6.1	2	4
15	25	9.3	0	15	53	7	3.9	2	5
16	24	0.	0	16	54	7	1.8	2	6
17	22	9.4	0	17	55	6	15.7	2	7
18	21	5.3	0	18	56	6	13.7	2	8
19	20	3.3	0	19	57	6	11.8	2	9
20	19	3.2	0	20	58	6	9.9	2	10
21	18	4.6	0	21	59	6	8.1	2	11
22	17	7.3	0	22	60	6	6.4	2	12
23	16	11.1	0	23	61	6	4.7	2	13
24	16	0.	1	0	62	6	3.1	2	14
25	15	5.8	1	1	63	6	1.5	2	15
26	14	12.3	1	2	64	6	0.	2	16
27	14	3.5	1	3	65	5	14.5	2	17
28	13	11.4	1	4	66	5	13.	2	18
29	13	3.9	1	5	67	5	11.7	2	19
30	12	12.1	1	6	68	5	10.3	2	20
31	12	6.2	1	7	69	5	9.	2	21
32	12	0.	1	8	70	5	7.8	2	22
33	11	10.1	1	9	71	5	6.5	2	23
34	11	5.1	1	10	72	5	5.3	3	0
35	10	15.5	1	11	73	5	4.1	3	1
36	10	10.6	1	12	74	5	3.	3	2
37	10	6.	1	13	75	5	2.	3	3

TABLE 1ST CONTINUED.

Hrs.	Weight of a Spyndle.		Spyndles & Heers in a lb.		Hrs.	Weight of a Spyndle.		Spyndles & Heers in a lb.	
	oz.	drs.				oz.	drs.		
76	5	0.8	3	4	114	3	5.9	4	18
77	4	15.6	3	5	115	3	5.4	4	19
78	4	14.8	3	6	116	3	5.	4	20
79	4	13.7	3	7	117	3	4.5	4	21
80	4	12.8	3	8	118	3	4.	4	22
81	4	11.8	3	9	119	3	3.6	4	23
82	4	10.9	3	10	120	3	3.1	5	0
83	4	10.	3	11	121	3	2.8	5	1
84	4	9.1	3	12	122	3	2.3	5	2
85	4	8.3	3	13	123	3	2.0	5	3
86	4	7.4	3	14	124	3	1.6	5	4
87	4	6.6	3	15	125	3	1.1	5	5
88	4	5.8	3	16	126	3	0.7	5	6
89	4	0.	3	17	127	3	0.3	5	7
90	4	4.2	3	18	128	3	0.	5	8
91	4	3.5	3	19	129	2	15.6	5	9
92	4	2.8	3	20	130	2	15.2	5	10
93	4	2.1	3	21	131	2	14.9	5	11
94	4	1.3	3	22	132	2	14.0	5	12
95	4	0.6	3	23	133	2	14.1	5	13
96	4	0.	4	0	134	2	13.8	5	14
97	3	15.3	4	1	135	2	13.5	5	15
98	3	14.7	4	2	136	2	13.1	5	16
99	3	14.	4	3	137	2	12.8	5	17
100	3	13.4	4	4	138	2	12.5	5	18
101	3	12.8	4	5	139	2	12.1	5	19
102	3	12.2	4	6	140	2	11.8	5	20
103	3	11.6	4	7	141	2	11.5	5	21
104	3	11.	4	8	142	2	11.2	5	22
105	3	10.5	4	9	143	2	10.9	5	23
106	3	10.	4	10	144	2	10.6	6	0
107	3	9.4	4	11	145	2	10.4	6	1
108	3	8.9	4	12	146	2	10.1	6	2
109	3	8.6	4	13	147	2	9.8	6	3
110	3	7.8	4	14	148	2	9.5	6	4
111	3	7.3	4	15	149	2	9.2	6	5
112	3	6.8	4	16	150	2	8.9	6	6
113	3	6.3	4	17	151	2	8.6	6	7

COTTON YARN.

There is no Act of the Legislature which fixes the quantity of yarn in a spyndle of cotton; but the following standard has been universally adopted by the cotton spinners in England, Scotland, and Ireland: The reel is 54 inches round, 80 threads or rounds of which make a skein, ley, or rap; 7 skeins make a number or hank, generally contracted No.; and 18 of these Nos. make one spyndle. Cotton yarn, however, is commonly sold by the pound weight, avoirdupois; and this takes place, whether the yarn be reeled or in cops; the number of hanks or Nos. in a pound indicating its fineness.

The length of the several subdivisions of the spyndle of cotton yarn will be found by the following

TABLE.

1½ yard = 1 thread or round of the cotton reel.
120 = 80 = 1 skein or ley.
840 = 560 = 7 = 1 No. or hank.
15120 = 10080 = 126 = 18 = 1 spyndle.

By comparing the lengths of the spyndles of cotton and linen together, it will appear, that the former exceeds the latter by 720 yards, which, in the calculation of warps, makes a difference of 14 porters and 8 splits. This difference added to 288, the porters in a spyndle of linen, gives 302 porters and 8 splits for the spyndle of cotton yarn; which is an advantage of 5 per cent. For 20 : 21 : : 288 : 302.4.

The weight of a spyndle of cotton yarn may be found from its Nos., and the contrary, by a process similar to that given under linen yarn. Thus, the proportion will be, as the weight of a spyndle: 16 : : 18: to the Nos. in a pound. But 16 and 18 are constant quantities, and also the mean terms of the proportion; their product, therefore, which is 288, divided by either extreme, will give the other.

Example 1. What is the weight of a spyndle of No. 86?

```
Here 86)288(3 oz. 5½ drs. nearly.
        258
        ———
         30
         16
        ———
     86)480(5.5
        430
        ———
         500
         430
         ———
          50
```

Example 2. If a spyndle of cotton yarn weigh 2½ oz., what is its No.?

```
           No.
 2.5)288.0(115        Or thus,  2½   288
     25                         2      2
     ——                         ——————————
      38                        5)   576
      25                             ———
     ———                             115½
      130
      125
      ———
        5
```

The number of spyndles in any bundle of cotton yarn will be found by the following rule:—

Multiply the Nos. of the yarn by the number of pounds in the bundle, and divide by 18.

Example 3. How many spyndles are in a 5 lib. bundle of No. 72?

$$\begin{array}{l} \quad\;\; 72 \\ \quad\;\;\;\; 5 \\ \hline 18)360(20 \text{ spyndles.} \\ \quad\;\; 36 \\ \hline \quad\;\;\;\; 0 \end{array}$$

These calculations may be found by inspection in Table II. agreeably to the titles on the top of the columns.

The Nos. of cotton yarn in copes are found by reeling a few hanks, commonly a spyndle, and weighing them on an instrument called a quadrant; then looking in a Table, such as the following one, for the weight of a spyndle, and the corresponding Nos. will be found in the left hand columns. This instrument consists of a brazen quadrantal rim, sometimes attached to a standard, but more frequently fixed to some convenient place in the warehouse. On the rim are engraven the ounces, drams, and decimal divisions of a dram; and when the reeled yarn is put into a scale which is appended, an index is turned round which points to the weight of the yarn. The Nos. of Merino worsteds, silk, &c. used in the shawl and plaid manufactures, and which have hitherto been regulated by no fixed standard, may be found in the same manner.

TABLE II.

COTTON YARN.

No.	Weight of a Spyndle.		Spyndles & Nos. in 5 lib.		No.	Weight of a Spyndle.		Spyndles & Nos. in 5 lib.	
	oz.	drs.	sp.	no.		oz.	drs.	sp.	no.
4	72	0.	1	2	46	6	4.2	12	14
4½	64	0.	1	4½	48	6	0.	13	6
5	57	9.6	1	7	50	5	12.1	13	16
5½	52	5.8	1	9½	52	5	8.6	14	8
6	48	0.	1	12	54	5	5.3	15	0
6½	44	4.9	1	14½	56	5	2.3	15	10
7	41	2.3	1	17	58	4	15.4	16	2
7½	38	6.4	2	1½	60	4	12.8	16	12
8	36	0.	2	4	62	4	10.3	17	4
9	32	0.	2	9	64	4	8.	17	14
10	28	12.8	2	14	66	4	5.8	18	6
11	26	3.	3	6	68	4	3.6	18	16
12	24	0.	3	6	70	4	1.8	19	8
13	22	2.4	3	11	72	4	0.	20	0
14	20	9.1	3	16	74	3	14.2	20	10
15	19	3.2	4	3	76	3	12.6	21	2
16	18	0.	4	8	78	3	11.	21	12
17	16	15.	4	13	80	3	9.6	22	4
18	16	0.	5	0	82	3	8.2	22	14
19	15	2.5	5	5	84	3	6.8	23	6
20	14	6.4	5	10	86	3	5.5	23	16
22	13	11.4	6	2	88	3	4.3	24	8
24	12	0.	6	12	90	3	3.2	25	0
26	11	1.2	7	4	92	3	2.1	25	10
28	10	4.5	7	14	94	3	1.	26	2
30	9	9.6	8	6	96	3	0.	26	12
32	9	0.	8	16	98	2	15.	27	4
34	8	7.5	9	8	100	2	14.	27	14
36	8	0.	10	0	102	2	13.1	28	6
38	7	9.2	10	10	104	2	12.2	28	16
40	7	3.2	11	2	106	2	11.4	29	8
42	6	13.7	11	12	108	2	10.6	30	0
44	6	8.7	12	4	110	2	9.9	30	10

TABLE II. CONTINUED.

No.	Weight of a Spyndle.		Spyndles & Nos. in 5 lib.		No.	Weight of a Spyndle.		Spyndles & Nos in 5 lib.	
	oz.	drs.	sp.	no.		oz.	drs.	sp.	no.
112	2	9.1	31	2	178	1	9.8	49	8
114	2	8.4	31	12	180	1	9.6	50	0
116	2	7.7	32	4	182	1	9.3	50	10
118	2	7.	32	14	184	1	9.	51	2
120	2	6.4	33	8	186	1	8.7	51	12
122	2	5.7	33	16	188	1	8.5	52	4
124	2	5.1	34	8	190	1	8.2	52	14
126	2	4.5	35	0	192	1	8.	53	6
128	2	4.	35	10	194	1	7.7	53	16
130	2	3.	36	2	196	1	7.5	54	8
132	2	2.9	36	12	198	1	7.3	55	0
134	2	2.3	37	4	200	1	7.0	55	10
136	2	1.8	37	14	202	1	6.7	56	2
138	2	1.3	38	6	204	1	6.5	56	12
140	2	0.9	38	16	206	1	6.3	57	4
142	2	0.4	39	8	208	1	6.1	57	14
144	2	0.	40	0	210	1	5.9	58	6
146	1	15.5	40	10	212	1	5.7	58	16
148	1	15.1	41	2	214	1	5.6	59	8
150	1	14.7	41	12	216	1	5.3	60	0
152	1	14.3	42	4	218	1	5.1	60	10
154	1	13.9	42	14	220	1	4.9	61	2
156	1	13.5	43	6	222	1	4.7	61	12
158	1	13.1	43	16	224	1	4.3	62	4
160	1	12.8	44	8	226	1	4.1	62	14
162	1	12.4	45	0	228	1	3.8	63	6
164	1	12.1	45	10	230	1	3.6	63	16
166	1	11.7	46	2	232	1	3.4	64	8
168	1	11.4	46	12	234	1	3.1	65	0
170	1	11.	47	4	236	1	2.8	65	10
172	1	10.8	47	14	238	1	2.6	66	2
174	1	10.4	48	6	240	1	2.4	66	12
176	1	10.1	48	16	242	1	2.9	67	4

When the quantity of yarn is less or more than a spyndle, to find its No. the proportion will be, as the weight of the quantity, to the ounces in a lib. viz. 16: so the numbers or hanks in the quantity, to the No. of the yarn.

Example 4. If 14 hanks weigh 2 oz., 3 drs., what is the fineness of the yarn?

Reduce the 2 oz., 3 drs. to drs., which are 35; the drs. in a pound are 256—then,

```
35 : 256 : : 14
      14
     ----
     1024
     256    No.
     ----
35)3584(102 Answer.
     35
     ----
       84
       70
     ----
       14
```

Example 5. In a web which weighs 5 lbs. 10 oz. there are 30 spyndles of warp; required the No. of the yarn?

First, as there are 90 oz. in the web, and 540 hanks in 30 spyndles; then we have

```
90 : 16 : : 540
             16
            ----
            3240
            540
            ----
       9.0)864.0
            ----
             96 the No. of the warp,
```

which after deducting 5 per cent. for waste, will be about No. 91.

Or secondly, find the weight of one spyndle, which is 3 oz.; then by the first rule,

3)288

96 as above.

To find the number of spyndles in any quantity of copes of a given fineness, the proportion will be; as 16, the oz. in a lib.: to the No. of the yarn :: so the ounces in the quantity: to the number of spyndles.

Example 6. In 2 lib. 10 oz. of copes, No. 72, how many spyndles?

Here 16 : 72 :: 42 the ozs. in the quantity.

42

144

288

16)3024(189 hks.

16

142

128

144

144

0

Here we have 189 hanks, which, divided by 18, gives 10 spyndles and 9 hanks.

Table 3 will be found useful to those who make use of yarn in the cope, either for warp or weft. When the Nos. exceed those on the top of the table, any two may be added together, which will answer the purpose.

TABLE III.

		No. 40.			No. 42.			No. 44.			No. 46.		
lbs.	oz.	sp.	hks.	pts.	sp.	hks.	pts.	sp.	hks.	pts.	sp.	hks.	pts.
	1		2	8		2	10		2	12		2	14
	2		5	0		5	4		5	8		5	12
	3		7	8		7	14		8	4		8	10
	4		10	0		10	8		11	0		11	8
	5		12	8		13	2		13	12		14	6
	6		15	0		15	12		16	8		17	4
	7		17	8	1	0	6	1	1	4	1	2	2
	8	1	2	0	1	3	0	1	4	0	1	5	0
	9	1	4	8	1	5	10	1	6	12	1	7	14
	10	1	7	0	1	8	4	1	9	8	1	10	12
	11	1	9	8	1	10	14	1	12	4	1	13	10
	12	1	12	0	1	13	8	1	15	0	1	16	8
	13	1	14	8	1	16	2	1	17	12	2	1	6
	14	1	17	0	2	0	12	2	2	8	2	4	4
	15	2	1	8	2	3	6	2	5	4	2	7	2
1		2	4		2	6		2	8		2	10	
2		4	8		4	12		4	16		5	2	
3		6	12		7	0		7	6		7	12	
4		8	16		9	6		9	14		10	4	
5		11	2		11	12		12	4		12	14	
6		13	6		14	0		14	12		15	6	
7		15	10		16	6		17	2		17	16	
8		17	14		18	12		19	10		20	8	
9		20	0		21	0		22	0		23	0	
10		22	4		23	6		24	8		25	10	
11		24	8		25	12		26	16		28	2	
12		26	12		28	0		29	6		30	12	
13		28	16		30	6		31	14		33	4	
14		31	2		32	12		34	4		35	14	
15		33	6		35	0		36	12		38	6	

TABLE III. CONTINUED.

		No. 48.			No. 50.			No. 52.			No. 54.		
lbs.	oz.	sp.	hks.	pts.	sp.	hks.	pts.	sp.	hks.	pts.	sp.	hks.	pts.
	1		3			3	2		3	4		3	6
	2		6			6	4		6	8		6	12
	3		9			9	6		9	12		10	2
	4		12			12	8		13	0		13	8
	5		15			15	10		16	4		16	14
	6	1	0		1	0	12	1	1	8	1	2	4
	7	1	3		1	3	14	1	4	12	1	5	10
	8	1	6		1	7	0	1	8	0	1	9	0
	9	1	9		1	10	2	1	11	4	1	12	6
	10	1	12		1	13	4	1	14	8	1	15	12
	11	1	15		1	16	6	1	17	12	2	1	2
	12	2	0		2	1	8	2	3	0	2	4	8
	13	2	3		2	4	10	2	6	4	2	7	14
	14	2	6		2	7	12	2	9	8	2	11	4
	15	2	9		2	10	14	2	12	12	2	14	10
1		2	12		2	14		2	16		3		
2		5	6		5	10		5	14		6		
3		8	0		8	6		8	12		9		
4		10	12		11	2		11	10		12		
5		13	6		13	16		14	8		15		
6		16	0		16	12		17	6		18		
7		18	12		19	8		20	4		21		
8		21	6		22	4		23	2		24		
9		24	0		25	0		26	0		27		
10		26	12		27	14		28	16		30		
11		29	6		30	10		31	14		33		
12		32	0		33	6		34	12		36		
13		34	12		36	2		37	10		39		
14		37	6		38	16		40	8		42		
15		40	0		41	12		43	6		45		

TABLE III. CONTINUED.

		No. 56.			No. 58.			No. 60.			No. 62.		
lbs.	oz.	sp.	hks.	pts.	sp.	hks.	pts.	sp.	hks.	pts.	sp.	hks.	pts.
	1		3	8		3	10		3	12		3	14
	2		7	0		7	4		7	8		7	12
	3		10	8		10	14		11	4		11	10
	4		14	0		14	8		15	0		15	8
	5		17	8	1	0	2	1	0	12	1	1	6
	6	1	3	0	1	3	12	1	4	8	1	5	4
	7	1	6	8	1	7	6	1	8	4	1	9	2
	8	1	10	0	1	11	0	1	12	0	1	13	0
	9	1	13	8	1	14	10	1	15	12	1	16	14
	10	1	17	0	2	0	4	2	1	8	2	2	12
	11	2	2	8	2	3	14	2	5	4	2	6	10
	12	2	6	0	2	7	8	2	9	0	2	10	8
	13	2	9	8	2	11	2	2	12	12	2	14	6
	14	2	13	0	2	14	12	2	16	8	3	0	4
	15	2	16	8	3	0	6	3	2	4	3	4	2
1		3	2		3	4		3	6		3	8	
2		6	4		6	8		6	12		6	16	
3		9	6		9	12		10	0		10	6	
4		12	8		12	16		13	6		13	14	
5		15	10		16	2		16	12		17	4	
6		18	12		19	6		20	0		20	12	
7		21	14		22	10		23	6		24	2	
8		24	16		25	14		26	12		27	10	
9		28	0		29	0		30	0		31	0	
10		31	2		32	4		33	6		34	8	
11		34	4		35	8		36	12		37	16	
12		37	6		38	12		40	0		41	6	
13		40	8		41	16		43	6		44	14	
14		43	10		45	2		46	12		48	4	
15		46	12		48	6		50	0		51	12	

TABLE III. CONTINUED.

		No. 64.			No. 66.			No. 68.			No. 70.		
lbs.	oz.	sp.	hks.	pts.	sp.	hks.	pts.	sp.	hks.	pts.	sp.	hks.	pts.
	1		4			4	2		4	4		4	6
	2		8			8	4		8	8		8	12
	3		12			12	6		12	12		13	2
	4		16			16	8		17	0		17	8
	5	1	2		1	2	10	1	3	4	1	3	14
	6	1	6		1	6	12	1	7	8	1	8	4
	7	1	10		1	10	14	1	11	12	1	12	10
	8	1	14		1	15	0	1	16	0	1	17	0
	9	2	0		2	1	2	2	2	4	2	3	6
	10	2	4		2	5	4	2	6	8	2	7	12
	11	2	8		2	9	6	2	10	12	2	12	2
	12	2	12		2	13	8	2	15	0	2	16	8
	13	2	16		2	17	10	3	1	4	3	2	14
	14	3	2		3	3	12	3	5	8	3	7	4
	15	3	6		3	7	14	3	9	12	3	11	10
1		3	10		3	12		3	14		3	16	
2		7	2		7	6		7	10		7	14	
3		10	12		11	0		11	6		11	12	
4		14	4		14	12		15	2		15	10	
5		17	14		18	6		18	16		19	8	
6		21	6		22	0		22	12		23	6	
7		24	16		25	12		26	8		27	4	
8		28	8		29	6		30	4		31	2	
9		32	0		33	0		34	0		35	0	
10		35	10		36	12		37	14		38	16	
11		39	2		40	6		41	10		42	14	
12		42	12		44	0		45	6		46	12	
13		46	4		47	12		49	2		50	10	
14		49	14		51	6		52	16		54	8	
15		53	6		55	0		56	12		58	6	

TABLE III. CONTINUED.

		No. 72.			No. 74.			No. 76.			No. 78.		
lbs.	oz.	sp.	hks.	pts	sp.	hks.	pts.	sp.	hks.	pts.	sp.	hks.	pts.
	1		4	8		4	10		4	12		4	14
	2		9	0		9	4		9	8		9	12
	3		13	8		13	14		14	4		14	10
	4	1	0	0	1	0	8	1	1	0	1	1	8
	5	1	4	8	1	5	2	1	5	12	1	6	6
	6	1	9	0	1	9	12	1	10	8	1	11	4
	7	1	13	8	1	14	6	1	15	4	1	16	2
	8	2	0	0	2	1	0	2	2	0	2	3	0
	9	2	4	8	2	5	10	2	6	12	2	7	14
	10	2	9	0	2	10	4	2	11	8	2	12	12
	11	2	13	8	2	14	14	2	16	4	2	17	10
	12	3	0	0	3	1	8	3	3	0	3	4	8
	13	3	4	8	3	6	2	3	7	12	3	9	6
	14	3	9	0	3	10	12	3	12	8	3	14	4
	15	3	13	8	3	15	6	3	17	4	4	1	2
1		4			4	2		4	4		4	6	
2		8			8	4		8	8		8	12	
3		12			12	6		12	12		13	0	
4		16			16	8		16	16		17	6	
5		20			20	10		21	2		21	12	
6		24			24	12		25	6		26	0	
7		28			28	14		29	10		30	6	
8		32			32	16		33	14		34	12	
9		36			37	0		38	0		39	0	
10		40			41	2		42	4		43	6	
11		44			45	4		46	8		47	12	
12		48			49	6		50	12		52	0	
13		52			53	8		54	16		56	6	
14		56			57	10		59	2		60	12	
15		60			61	12		63	6		65	0	

SECT. II. REEDS.

THE reed is the scale by which, independent of its being employed for striking up the woof, the manufacturer determines the fineness of his cloth, being so constructed that a certain number of warp threads may always be contained in a given breadth of the web.

For the principal manufactures of Scotland and Ireland, the scale of reeds is regulated by the number of splits contained in the Scotch ell of 37 inches. The splits in this space are divided into hundreds, the number of which, in any reed, indicates its sett, and each hundred is again divided into five parts, called porters, which consequently contain twenty splits. Reeds made for Hollands and cambrics, which were, till of late, very common in Scotland, had scales peculiar to themselves, the hundreds or sett of the former being counted on 40 inches, and of the latter on 34, which corresponded to the breadths of their respective fabrics.

In England the scales of reeds are different from any of the preceding. Those denominated the Manchester and Bolton reeds, take their designation from the number of dents (splits) in 24½ inches, and are divided into beers, (porters) which contain sometimes 19, but more frequently 20 dents. The sett or fineness of the Stockport reeds is known by the number of ends or threads of warp in an inch; and as two ends are equivalent to one dent, the fineness or sett of the reed is expressed by the number of dents in two inches. Thus, a 40 reed has 20 dents in an inch, a 50, 25 dents, &c. In Manchester they generally make use of the Stockport count for muslins only, and the Bolton, for quiltings, dimities, ginghams, muslins, corduroys, &c. There are several kinds of goods, however, such as calicoes, checks and handkerchiefs, which are woven in reeds constructed on 36 inches; and, indeed, each of these scales seems to be adapted to peculiar kinds of cloth, as was formerly the case with respect to the Holland, cambric and lawn reeds in Scotland.

The fineness of any piece of cloth, therefore, takes its denomination from the sett of reed in which it has been woven, without any regard to its breadth, or the quantity of warp it may contain; for when the cloth is intended to be broader or narrower than the standard, proportional parts must be added or subtracted, to give the requisite quantity of warp. Thus, the standard for Scotch reeds is 37 inches, which is commonly divided into 16 parts, called nails; and the breadth of a web is generally expressed by the number of nails or sixteenths which it fills of the reed. This was uniformly the case with respect to all goods made of linen yarn, which were subjected to the inspection of a stamp master; but since the cotton manufacture has become so extensive, and every manufacturer must make his goods to suit the market for which they are destined, it is more common to calculate the breadths of webs by inches.

Hence, when the standard is divided into nails, to find how much warp is requisite for any breadth of a given sett of reed, multiply the number of splits in an ell or 37 inches, by the nails in the breadth of the web, and divide by 16. Or, make the nails in the breadth of the web the numerator of a vulgar fraction, and 16 the denominator; then, after having reduced the fraction to its lowest terms, multiply by the former, and divide by the latter.

Example 1. How much warp is requisite for a 1300 web, 18 nails broad?

$$\text{Here } \frac{18}{16}=\frac{9}{8} \text{ then, } \begin{array}{r} 1300 \\ 9 \\ \hline 8)11700 \\ \hline \end{array}$$

1462½ splits, or 14 hundreds, 3 porters.
2½ splits.

2. How many splits of a 1100 reed will be filled by a web 17 nails broad?

Here, $\frac{1100 \times 17}{16} = 1169$ splits nearly, or 11 hundred, 3 porters, and 9 splits.

Or thus; divide the splits in ell, by the difference between the given breadth and ell, then add or subtract the quotient to or from the splits in ell, as the breadth exceeds or falls short thereof.

In the first example, the difference is $\frac{2}{16}$ths or $\frac{1}{8}$th; in second, $\frac{1}{16}$th; then,

First, 8)1300
162½
1462½

Second, 16)1100
69 nearly.
1169 as above.

When the breadth is given in inches, to find the number of splits, multiply the warp in an ell by the number of inches broad, and divide by 37.

Example. How many splits warp are in a 1000 reed 32 inches broad?

Here, 1000
32
37)32000(865 nearly.
296
240
222
180
185

Table IV. contains the number of splits in the breadth, from 36 to 72 inches, and from a 600 to a 2400. When either more or fewer inches are required, it is only necessary to add or subtract such numbers as will give the answer.

To reduce cambric reeds to reeds on 37 inches, say,

As 34 : 37 : : so the cambric : to the lawn or 37 inch reed.

Thus, to find what reed on 37 inches is equivalent to 2000 cambric, say,

As 34 : 37 : : 2000 : 2176, or 21 hundred, 3 porters and 16 splits.

To reduce Holland reeds to reeds on 37 inches, the proportion is,

As 40 : 37 : : so the Holland : to the lawn or 37 inch reed.

Example. How many splits of a 19 hundred Holland reed are there in 37 inches? say,

As 40 : 37 : : 1900 : 1757½ splits.

The number of the reed in which any piece of cloth has been woven, is generally ascertained by the help of a small instrument, called a web glass. It consists of a magnifying glass fixed in a brass stand, at the focus of which is a plate perforated with holes, adapted to the different scales of reeds: when these holes are adapted to the reeds used in Scotland, they are of such a size, that we can count one thread of warp for each hundred or sett of the reed; but in England, they are usually adapted to the number of threads in an inch, or some part of an inch.

Hence, to find if a web glass be accurately made, we say,

As 100 : 37 : : 1 : 0.37; that is, $\frac{37}{100}$ parts of an inch.

This, however, would show a split for each hundred of the reed; but to show single threads, it must be divided by 2, which gives .185, the decimal parts of an inch for the diameter of the hole. Again, if one inch be divided by this fraction, we will have the number of times this glass will be contained in an inch, thus,

$$\frac{1.000}{.185}=5.4054, \text{ or } 5\tfrac{2}{5} \text{ nearly.}$$

Hence it is evident, that if any number of shots of weft, counted by the glass for 37 inches, be multiplied by 5.4, it will give the shots in an inch, and the contrary.

If the web glass were intended to count one thread for each porter in 37 inches, which is necessary for very coarse fabrics, we have only to multiply the fraction .185 by 5, because 5 porters make a hundred, and the product, .925 is the diameter of the aperture of the plate.

Table V. exhibits a comparison of the English reeds. In the first column are the Nos. or setts of the Manchester and Bolton count; and in the second, the number of dents and hundredth parts of a dent in an inch. The number of dents in any piece of cloth, will therefore be found by multiplying these numbers for any given reed, by the inches in the breadth. Thus, if it were required to find the number of dents in 49 inches of a 40 reed, we have

$$\begin{array}{r} 32.98 \\ 50 \\ \hline 1649.00 \end{array}$$

that is 1649 dents.

The third and fifth columns contain the Nos. of the Stockport reeds; and the fourth and sixth, the number of dents less or more on a yard than the Manchester count. For example: Suppose I have a 60 reed Stockport, and wish to know what it is Manchester count, I look in the third column for 60, and in the same line in the fourth column I find 12+36, which shows that a 60 Stockport has 12 dents more in a yard than a 36 Manchester and Bolton.

TABLE IV.

Showing the number of Splits in the following Setts of Reed, and inches broad.

Inches.	600	700	800	900	1000	1100
36	584	681	778	876	973	1070
37	600	700	800	900	1000	1100
38	616	718	821	924	1027	1130
39	632	737	842	949	1054	1159
40	649	756	864	973	1081	1189
41	665	775	885	997	1108	1219
42	681	795	907	1022	1135	1249
43	697	814	929	1046	1162	1278
44	714	832	950	1070	1189	1308
45	730	851	972	1095	1216	1338
46	746	870	994	1119	1243	1368
47	762	889	1015	1143	1270	1397
48	778	908	1037	1168	1297	1427
49	795	927	1058	1192	1324	1457
50	811	945	1080	1216	1351	1486
51	827	964	1102	1241	1378	1516
52	843	987	1123	1265	1405	1546
53	860	1002	1145	1289	1432	1576
54	876	1021	1167	1314	1459	1605
55	892	1041	1188	1338	1486	1635
56	908	1059	1210	1362	1514	1665
57	924	1078	1231	1386	1541	1695
58	941	1097	1253	1411	1568	1724
59	957	1116	1275	1435	1595	1754
60	972	1135	1296	1459	1622	1784
61	999	1154	1318	1484	1649	1814
62	1015	1173	1340	1508	1676	1843
63	1032	1192	1361	1532	1703	1873
64	1048	1211	1383	1557	1729	1903
65	1064	1230	1404	1581	1756	1932
66	1070	1249	1426	1605	1784	1962
67	1086	1268	1448	1630	1811	1992
68	1103	1287	1469	1654	1838	2022
69	1119	1305	1491	1678	1865	2051
70	1135	1324	1522	1703	1892	2081
71	1151	1343	1534	1727	1919	2111
72	1168	1362	1557	1751	1946	2141

TABLE IV. CONTINUED.

Inches.	1200	1300	1400	1500	1600	1700
36	1168	1264	1362	1459	1556	1654
37	1200	1300	1400	1500	1600	1700
38	1232	1335	1438	1541	1643	1746
39	1265	1370	1476	1581	1686	1792
40	1297	1405	1513	1622	1729	1838
41	1330	1441	1551	1662	1772	1884
42	1362	1476	1589	1703	1815	1930
43	1395	1511	1627	1743	1858	1976
44	1427	1546	1665	1784	1902	2021
45	1459	1581	1703	1824	1945	2067
46	1492	1616	1741	1865	1989	2113
47	1524	1651	1778	1905	2032	2159
48	1556	1686	1816	1946	2075	2205
49	1589	1722	1854	1986	2118	2251
50	1621	1756	1892	2027	2162	2297
51	1654	1792	1930	2067	2205	2343
52	1686	1827	1968	2108	2248	2389
53	1719	1862	2005	2148	2291	2435
54	1751	1897	2043	2189	2335	2481
55	1784	1932	2081	2230	2378	2527
56	1816	1968	2119	2270	2421	2573
57	1849	1993	2157	2311	2464	2619
58	1881	2028	2195	2351	2508	2665
59	1914	2063	2232	2392	2551	2711
60	1946	2098	2270	2432	2594	2757
61	1978	2133	2308	2473	2637	2803
62	2011	2168	2346	2513	2681	2848
63	2043	2204	2384	2553	2724	2894
64	2076	2239	2421	2594	2767	2940
65	2108	2276	2459	2635	2810	2986
66	2141	2309	2497	2676	2853	3032
67	2173	2344	2535	2716	2897	3078
68	2205	2379	2573	2756	2940	3124
69	2238	2414	2611	2777	2983	3170
70	2270	2449	2649	2837	3026	3216
71	2303	2495	2686	2878	3070	3262
72	2335	2530	2724	2919	3113	3308

TABLE IV. CONTINUED.

Inches.	1800	1900	2000	2100	2200	2300
36	1752	1850	1946	2043	2141	2238
37	1800	1900	2000	2100	2200	2300
38	1848	1951	2054	2154	2260	2362
39	1898	2003	2108	2211	2318	2424
40	1946	2054	2162	2268	2378	2487
41	1994	2105	2216	2325	2438	2549
42	2044	2157	2270	2385	2498	2612
43	2092	2208	2324	2442	2556	2674
44	2140	2259	2378	2496	2616	2736
45	2180	2311	2432	2553	2676	2798
46	2238	2362	2486	2610	2736	2861
47	2286	2413	2540	2667	2794	2923
48	2336	2465	2594	2724	2854	2985
49	2384	2516	2648	2781	2914	3047
50	2432	2567	2702	2835	2972	3109
51	2482	2619	2756	2892	3032	3172
52	2530	2670	2810	2961	3092	3233
53	2578	2701	2864	3006	3152	3296
54	2628	2773	2918	3063	3210	3358
55	2676	2824	2972	3123	3270	3420
56	2724	2876	3028	3177	3330	3482
57	2772	2927	3082	3234	3390	3544
58	2822	2978	3136	3291	3448	3606
59	2870	3030	3190	3348	3508	3669
60	2918	3081	3244	3405	3568	3731
61	2968	3132	3298	3462	3628	3793
62	3016	3184	3352	3519	3686	3855
63	3064	3235	3406	3576	3746	3917
64	3114	3286	3459	3633	3806	3980
65	3162	3338	3512	3690	3864	4042
66	3210	3389	3568	3747	3924	4104
67	3260	3440	3622	3804	3984	4166
68	3308	3491	3676	3861	4044	4228
69	3356	3543	3730	3915	4102	4290
70	3406	3595	3784	3972	4162	4352
71	3454	3645	3838	3929	4222	4413
72	3502	3697	3892	4086	4282	4477

TABLE V.

Manchester and Bolton.	Dents, and 100 parts in an inch.	Stockport Count.	Dents in a yard less or more than Manchester and Bolton.	Stockport Count.	Dents in a yard less or more than Manchester and Bolton.
20	16.49	34	11—21	100	11—61
22	18.14	36	5—22	102	4—62
24	19.79	38	2+23	104	2+63
26	21.44	40	8+24	106	8+64
28	23.09	42	14+25	108	15+65
30	24.74	44	9—27	110	9—67
32	26.39	46	3—28	112	2—68
34	28.04	48	3+29	114	4+69
36	29.69	50	10+30	116	10+70
38	31.34	52	14—32	118	13—72
40	32.98	54	7—33	120	7—73
42	34.63	56	1—34	122	1—74
44	36.28	58	5+35	124	6+75
46	37.93	60	12+36	126	12+76
48	39.58	62	12—38	128	11—78
50	41.23	64	5—39	130	5—79
52	42.88	66	1+40	132	1+80
54	44.53	68	7+41	134	8+81
56	46.18	70	13+42	136	14+82
58	47.83	72	10—44	138	10—84
60	49.48	74	4—45	140	3—85
62	51.13	76	3+46	142	3+86
64	52.78	78	9+47	144	9+87
66	54.43	80	14—49	146	14—89
68	56.08	82	8—50	148	8—90
70	57.73	84	2—51	150	1—91
72	59.38	86	5+52	152	5+92
74	61.03	88	11+53	154	11+93
76	62.68	90	12—55	156	12—95
78	64.32	92	6—56	158	6—96
80	65.97	94	——57	160	——97
90	74.22	96	6+58	162	7+98
100	82.47	98	13+59	164	13+99

SECT. III. CAAMING, SLEYING OR SETTING.

These terms are severally employed to denote the proportioning of the grists or fineness of warps to the different setts of reeds, so as to preserve a uniformity of fabric in the same species of cloth. In order to explain what is meant by the word fabric; let us suppose that a piece of cloth is woven in any sett of reed, as for instance, a 1200 on 37 inches, and that the diameters of the warp threads and the small spaces between them are exactly of the same size. Then, if we have another piece of cloth of the same texture, woven, for example, in an 1800 reed, the diameters of the warp threads being also equal to the intervening spaces, then these two sizes of cloth are said to be of the same fabric, although the one is a third finer than the other; so that, when the diameters of the threads are greater than the spaces, the fabric is proportionally stouter, and the reverse when they are smaller. Now, the method of determining the several grists of yarn that will preserve this uniformity of fabric through the different setts of reed, depends on the following analogy:—

As the square of any given reed:
To the grist of yarn that suits that sett::
So is the square of any other sett of reed:
To its respective grist for the same fabric.

The reason of this rule will evidently appear, by considering the threads of warp, when stretched in the loom, as so many cylinders of equal length or altitude, and the reed as the scale which measures the space in which a given number of these threads are contained; therefore, the solidities of the threads in one sett of reed, will be to the solidities of those in any other sett of reed, as their bases, or, which is the same thing, as the squares of their diameters, by *p.* 11. *b.* 12 of Euclid. But the weights of the cylinders or threads, supposing them of the same density will be as their solidities; and a determinate number of splits or dents of any reed, or rather the intervals between them, may be substituted for the diameters of the warp threads which pass through them: therefore, by the last analogy, it will be, as the square of the number of splits in any given reed, to the known weight or grist of yarn; so is the square of any other number of splits, occupying the same space, to the weight or grist of yarn that will produce cloth of the same fabric, which is the rule given above.

The threads of warp are here supposed to be all of the same density, which may in some instances appear not to be the case, owing to the difference of twist they may have received in spinning; but when the warps are tightly stretched in the loom, and all their fibres compactly laid by the weaver's dressing, their density, though perhaps not mathematically the same, will be sufficiently near to answer every practical purpose of the manufacturer.

Example 1. If No. 72 make a 1200 jaconet, what will suit a 1600?

Here, 144 is the square of 12, and 256 the square of 16;
then 144 : 72 : : 256
72
512
1792
144)18432(128 No.
144
403
288
1152
1152

So that No. 148, woven in a 1600 reed, will make the same fabric as 72 in a 1200.

When the reed contains odd porters, which is frequently the case where the fabrics are coarse, the hundreds must be reduced to porters, and squared as above.

Example 2. Suppose No. 50 for a 1200 pullicate, what will answer a 900 and 3 porters.

```
       hund.              hund. pors.
  say, 12                    9    3
        5                    5
      ----                 ----
       60                   48
       60                   48
      ----                 ----
     3600                  384
                          192
                          ----
              3600 : 50 :: 2304
                              50 No.
                         --------
                  36|00)1152|00(32, Answer.
                         108
                         ----
                          72
                          72
```

When the grist of yarn is given to find the reed, invert the terms of the proportion, and extract the square root of the fourth term for the answer.

Example 3. If No. 70 make a 1600 cotton cambric, what sett will No. 93 make?

The square of 16 is 256.

```
then, 70 : 256 :: 93 : 340.   And 3̇40̇.8(18.46
            93                     1
          ----                   ----
           768                 28)240
          2304                   8 224
          ----                  -----
      7|0)2380(8               364(1680
          ----                   4 1456
           340—8               ----------
                               3686(22400
                                    22116
                                    -----
                                      284
```

That is, 18 hundred reed, 46 splits, or 18½ nearly.

When linen yarn is gristed by the number of heers in the pound, the process will be the very same as the preceding, only substituting the heers for Nos. but when it is gristed by the weight of a spyndle or hesp, the proportion will be inverse, as the numbers expressing the grist of the yarn decrease, while those denoting the setts of reed increase.

Example 4. If yarn which weighs 8 oz. per hesp make a 600 lawn, what grist of yarn will make a 1200 of the same fabric?

Say, as 36 : 8 : : 144 : 2 oz.
8
144)288(2
288
0

Example 5. If $4\frac{1}{8}$ oz. per hesp, work in a 600 gauze, what will answer an 800?

Here the ounces must be reduced to eighths, which are 33,
then, 36 : 33 : : 64 : 18½ eighths, or 2 oz. 5 drs.
33
108
108
64)1188(18
64
548
512
36=½ nearly

Example 6. Suppose, as before, 8 oz. to a 600 lawn, what reed will 4 oz. require, to make the same fabric?

Say, 8 : 36 : : 4 : 72, then 7$\dot{2}$(8.48
64

---

164)800
656

1688)14400
13504

896

That is, 8 hundred and 48 splits, or an 8½ nearly.

These examples, though sufficiently plain to illustrate the general principles of caaming, may still, in practice, be considered as intricate and perplexing to those who are unacquainted with the management of square numbers. In order, therefore, to facilitate these calculations, and render them as simple as possible, the two following tables are inserted, by the help of which caaming tables may be constructed to the greatest degree of accuracy, for every fabric within the range of our most extended manufactures.

In Table VI. the third column contains the complete hundreds or setts of reed on 37 inches from 1 to 32, and along the top, the odd porters. In the first column are the nearest corresponding numbers of the Manchester and Bolton count, and in the second, those of Stockport. In the body of the Table are the logarithms, with their indices, of the squares of all these setts of reed, agreeably to their respective titles. Table VII. contains all the Nos. of yarn, with their logarithms and indices from 1 to 264 inclusive.

USE OF THE TABLES.

1. Take out the logarithm of the given sett of reed from Table VI. and subtract it from 10,000, or which is the

same thing, subtract every figure of the logarithm from 9, except the unit figure, which take from 10, and reserve the remainder. This subtraction, which is merely finding the reciprocal of the logarithm, may always be performed mentally, as the figures are taken out of the table.

2. Take out the logarithm of the given grist of yarn, from Table VII. and add it to the remainder reserved above, and their sum will be a constant quantity ready for the construction of the table.

3. Write down this constant quantity on a piece of paper, and to it add the logarithm of any other reed, and their sum will be the logarithm of the grist of yarn sought, which will be found in the adjacent column.

Example.—Suppose it were required to make a caaming table, commencing with a 700 reed, for jaconets, whose fabric is made by weaving No. 75 in a 1200, and wefted with No. 94. First, look in the third column of Table VI. for 1200, and opposite to it in the fourth column will be found 2158. Take this from 10,000 leaves 7842; which is done mentally thus: beginning at the left hand say, 2 from 9, leaves 7; 1 from 9, leaves 8; 5 from 9, leaves 4; and 8, the unit figure from 10 leaves 2. To this number 7842 add the logarithm of 75 from Table VII. viz. 1875, and their sum, which is 9717, will be a constant quantity for the construction of the table.

Secondly, To this last number add the logarithm of 700, viz. 1690, and look for their sum, viz. 1407, (rejecting 1 at the left hand when the sum of the addition exceeds four figures,) or nearest number thereto in Table VII. which is 26, and this will be the No. of the warp for a 700 reed.

Again, Take down the constant number, and to it add the logarithm of seven hundred and a half, which is 1750, and the number answering to their sum, viz. 1467 in Table VII. is 29, the No. for a 7½ reed; and so on, as in the following specimen, where a caaming table is given at length, both for warp and weft:—

Reeds.	Warp.	Weft.
700	26	32
7½	29	37
800	33	42
8½	38	47
900	42	53
9½	47	59
1000	52	65
10½	58	72
1100	63	79
11½	69	86
1200	75	94
12½	81	102
1300	88	110
13½	95	119
1400	102	128
14½	109	136
1500	117	147
15½	125	157
1600	133	167
16½	142	178
1700	150	188
17½	160	200
1800	169	211
18½	179	223
1900	188	235
19½	199	248
2000	208	261

Constant
quantity. 9717
700 . . . 1690 Warp
——No.
1.1407=26

9717
7½ . . . 1750
1.1467=29

9717
800 . . 1806
1.1523=33

9717
8½ . . . 1858
1.1575=38

9717
900 . . 1908
1.1625=42

9717
9½ . . . 1955
1.1672=47

9717
1000 . 2000
1.1717=52

9717
10½ . . 2042
1.1759=58
&c.

Constant
quantity. 9815
700 . . 1690 Weft
——No.
1.1505=32

9815
7½ . . . 1750
1.1565=37

9815
800 . . 1806
1.1621=42

9815
8½ . . . 1858
1.1673=47

9815
900 . . 1908
1.1723=53

9815
9½ . . . 1955
1.1770=59

9815
1000 . . 2000
1.1815=65

9815
10½ . . 2042
1.1857=72
&c.

When caaming tables are required for reeds with odd porters, the logarithms for these reeds are found in the table on a line with the complete hundreds, and below the number of odd porters, and managed as with the half setts in the preceding example.

In this manner may caaming tables be made for any fabric that can be proposed, when the yarn is gristed by the number of hanks or heers in the pound; but when the yarn is gristed by the weight of a spyndle, half spyndle, or hank, the logarithm of the reed must always be subtracted from the constant quantity, as the proportion in this case, is inverse.

Example of a caaming table for clear lawn, whose fabric is made by weaving 2 oz. per hesp or half spyndle, in a 1200 reed.

Reduce the ounces to drams, which are 32; then the sum of the logarithms of 1200 and 32 is 3663, which is a constant number from which the logarithms of the other setts are to be subtracted.

Thus, Constant Number, 3663
Logarithm of 600=1556

2507=128 drs.=8 oz.

600½=3663
1625

2038=109 do.=6 oz. 13 drs.

700=3663
1690

1973=94 do.=5 oz. 14 drs
&c.

In like manner may caaming tables be made for English reeds; for it is only necessary to annex the nearest Nos. of the English counts found in Table VI. to the grists of yarn, suitable to the reeds on 37 inches; or the intermediate setts of the former may be ascertained sufficiently accurate, by proportioning them to the odd porters of the latter.

TABLE VI.

REEDS.

Manch. & Bolton.	Stockport.	Hund. on 37 inches.	Log. hund.	Log. 1 por.	Log. 2 por.	Log. 2½ por.	Log. 3 por.	Log. 4 por.
3½	6	100	0000	0158	0292	0352	0408	0510
6½	10	200	0602	0684	0760	0795	0830	0894
10	16	300	0954	1010	1061	1088	1112	1159
13	22	400	1204	1246	1286	1306	1324	1462
16½	26	500	1397	1432	1464	1480	1496	1526
20	32	600	1556	1584	1612	1628	1639	1664
23	38	700	1690	1714	1738	1750	1760	1784
26	44	800	1806	1827	1848	1858	1868	1888
29½	48	900	1908	1927	1946	1955	1964	1982
33	54	1000	2000	2017	2034	2042	2050	2066
36	60	1100	2083	2098	2113	2121	2128	2143
39½	64	1200	2158	2172	2186	2193	2201	2214
42½	70	1300	2227	2241	2254	2260	2267	2279
46	76	1400	2292	2304	2316	2322	2328	2340
49	82	1500	2352	2363	2375	2380	2386	2397
52½	86	1600	2408	2419	2429	2434	2440	2450
56	92	1700	2460	2471	2481	2486	2491	2500
59	98	1800	2510	2520	2529	2534	2539	2548
62½	102	1900	2557	2566	2575	2580	2584	2593
65½	108	2000	2602	2610	2619	2623	2627	2636
69	114	2100	2644	2652	2660	2664	2668	2676
72	118	2200	2684	2692	2700	2704	2708	2715
75½	124	2300	2723	2730	2738	2742	2745	2753
78½	130	2400	2760	2767	2774	2778	2781	2788
82	134	2500	2795	2802	2809	2813	2816	2823
85	140	2600	2829	2836	2843	2846	2849	2856
88½	146	2700	2862	2869	2875	2878	2881	2888
92	152	2800	2894	2900	2906	2909	2912	2918
95	156	2900	2924	2930	2936	2939	2942	2948
98½	162	3000	2954	2960	2965	2968	2971	2977
102	168	3100	2982	2988	2993	2996	2999	3004
105	172	3200	3010	3015	3021	3023	3026	3031

TABLE VII.

NUMBERS OF COTTON YARN.

No.	Log.	No.	Log.	No.	Log.	No.	Log.
1	0000	34	1531	67	1826	100	2000
2	0301	35	1544	68	1832	101	2004
3	0477	36	1556	69	1838	102	2008
4	0602	37	1568	70	1845	103	2012
5	0698	38	1579	71	1851	104	2017
6	0778	39	1591	72	1857	105	2021
7	0845	40	1602	73	1863	106	2025
8	0903	41	1612	74	1869	107	2029
9	0954	42	1623	75	1875	108	2033
10	1000	43	1633	76	1880	109	2037
11	1041	44	1643	77	1886	110	2041
12	1079	45	1653	78	1892	111	2045
13	1114	46	1662	79	1897	112	2049
14	1146	47	1672	80	1903	113	2053
15	1176	48	1681	81	1908	114	2056
16	1204	49	1690	82	1913	115	2060
17	1230	50	1699	83	1919	116	2064
18	1255	51	1707	84	1924	117	2068
19	1278	52	1716	85	1929	118	2071
20	1301	53	1724	86	1934	119	2075
21	1322	54	1732	87	1939	120	2079
22	1342	55	1740	88	1944	121	2082
23	1361	56	1748	89	1949	122	2086
24	1380	57	1755	90	1954	123	2090
25	1398	58	1763	91	1959	124	2093
26	1415	59	1770	92	1963	125	2096
27	1431	60	1778	93	1968	126	2100
28	1447	61	1785	94	1973	127	2103
29	1462	62	1792	95	1977	128	2107
30	1477	63	1799	96	1982	129	2110
31	1491	64	1806	97	1986	130	2113
32	1505	65	1812	98	1991	131	2117
33	1518	66	1819	99	1995	132	2120

TABLE VII. CONTINUED.

No.	Log.	No.	Log.	No.	Log.	No.	Log.
133	2123	166	2220	199	2298	232	2365
134	2127	167	2222	200	2301	233	2367
135	2130	168	2225	201	2303	234	2369
136	2133	169	2227	202	2305	235	2371
137	2136	170	2230	203	2307	236	2373
138	2139	171	2232	204	2309	237	2374
139	2143	172	2235	205	2311	238	2376
140	2146	173	2238	206	2313	239	2378
141	2149	174	2240	207	2315	240	2380
142	2152	175	2243	208	2318	241	2382
143	2155	176	2245	209	2320	242	2383
144	2158	177	2247	210	2322	243	2385
145	2161	178	2250	211	2324	244	2387
146	2164	179	2252	212	2326	245	2389
147	2167	180	2255	213	2328	246	2391
148	2170	181	2257	214	2330	247	2392
149	2173	182	2260	215	2332	248	2394
150	2176	183	2262	216	2334	249	2396
151	2178	184	2264	217	2336	250	2398
152	2181	185	2267	218	2338	251	2399
153	2184	186	2269	219	2340	252	2401
154	2187	187	2271	220	2342	253	2403
155	2190	188	2274	221	2344	254	2405
156	2193	189	2276	222	2346	255	2406
157	2195	190	2278	223	2348	256	2408
158	2198	191	2281	224	2350	257	2410
159	2201	192	2283	225	2352	258	2411
160	2204	193	2285	226	2354	259	2413
161	2206	194	2287	227	2356	260	2415
162	2209	195	2290	228	2358	261	2416
163	2212	196	2292	229	2359	262	2418
164	2214	197	2294	230	2361	263	2420
165	2217	198	2296	231	2363	264	2421

Another practical method of making caaming tables may be derived from the following property of numbers:—

If any square number be divided by its root, and to the square adding the quotient, and this sum divided by the same root, and the quotient added to the said sum, the result will be the square of a number greater by unity than the given root.

For example:—4)16, is the square of 4,
4
4)20
5
5)25, is the square of 5,
5
5)30
6
36, is the square of 6, &c.

Having fixed on the grist of yarn for the given sett of reed, as before, divide the grist of the yarn by the complete hundreds of the reed, and to the dividend add the quotient; this sum is the grist of yarn for the next half sett. Divide the grist thus found by the same complete hundreds, and add the quotient as before, and the sum will be the grist of yarn, answering the next full sett. This operation is to be repeated at every full sett, always dividing the grist of yarn for any full sett, by that sett, both for the half, and full sett immediately following: But in carrying the table below the given sett, the quotients must always be subtracted.

Take the foregoing Example, which has been already wrought by logarithms, where No. 75 makes a 1200 jaconet.

12)75
add 6.25

12)81.25 for a 12½
add 6.77

13)88.02 — 13
add 6.77

13)94.79 — 13½
add 7.29

14)102.08 — 14
add 7.29

14)109.37 — 14½
add 7.8

15)117.17 — 15
add 7.8

15)124.97 — 15½
add 8.33

16)133.30 — 16
add 8.33

16)141.63 — 16½
add 8.85

150.48 — 17
&c.

And for descending below the given sett.

12)75
sub. 6.25

12)68.75 for 11½
sub. 5.73

11)63.02 — 11
sub. 5.73

11)57.29 — 10½
sub. 5.20

10)52.09 — 10
sub. 5.2

10)46.89 — 9½
sub. 4.69

42.20 — 9
&c.

From the above specimen it appears, that the last quotient of one sett, and first quotient of the sett following, are always the same numbers, so that one division only is necessary for each full sett.

AN EXAMPLE FOR LINEN YARN.

Suppose 16 oz. per spyndle, or 8 oz. per hesp, to work in a 600 clear lawn; it is required to form a caaming table for the different setts of the same fabric.

First find in Table I. the number of heers in the pound corresponding to 16 oz. per spyndle, which in this case, are 24. Then,

6)24 for a 6
add 4
——
6)28 — $6\frac{1}{2}$
add 4_{3}
——
7)$32\frac{2}{3}$ — 7
add $4\frac{2}{3}$
——
7)$37\frac{1}{3}$ — $7\frac{1}{2}$
add $5\frac{1}{3}$
——
8)$42\frac{2}{3}$ — 8
add $5\frac{1}{3}$
——
8)48 — $8\frac{1}{2}$
add 6
——
54 — 9
&c.

Or decimally thus
6)24 $=6^{00}$
4
——
6)28 $=6\frac{1}{2}$
$4.\dot{6}$
——
7)$32.\dot{6}=7$
$4.\dot{6}$
——
7)$37.\dot{3}=7\frac{1}{2}$
$5.\dot{3}$
——
8)$42.\dot{6}=8$
$5.\dot{3}$
——
$48.0=8\frac{1}{2}$
&c.

Thus the number of heers in the pound is found, at each operation, answering the different half setts; from which the weight of a spyndle or half spyndle will be found by inspection, in Table I. for opposite $32\frac{2}{3}$ heers, or rather 33, is 11 oz. 10.1 drs. per spyndle, the half of which is 5 oz. 13 drs. per hesp; and so on for any other grist.

The following setts for several fabrics of cloth are added, merely to exemplify the preceding methods of constructing caaming tables.

1000 Book, or hard muslin, from No. 82 to 110; weft from No. 90 to 110.
900 Cotton Gauze, No. 84; weft about the same.
1300 Cotton Shirting, No. 34; weft 38.
1200 Pullicate, No. 50; weft about the same.
1200 Gingham, No. 36; weft 40 to 44.
1600 Cotton Cambric, on 37 inches, No. 70; weft 96.
1600 Do. do. on 34 do. No. 75; do. 104.
1100 Cossie, No. 52; weft about the same.
1500 Linen, on 40 inches, 8 oz. per hesp; weft 7 oz.
1600 Linen Cambric, on 34 inches, 5⅝ oz. per spyndle; weft 5 oz.
1600 Linen Cambric, French Yarn, 6 oz. per penee; weft 5¼ oz.
1200 Clear Lawn, 2 oz. 10 drs. per hesp; weft 2 oz. 6 drs.
1400 Do. do. French Yarn, 5 oz. per penee; weft 4½ oz.
2200 Holland, on 40 inches, 8 oz. per spyndle; weft 7 oz.
1400 Shirt Linen, 6 oz. per hesp; weft 5 oz.
600 Linen Gauze, 4⅛ oz. per hesp; weft 5 oz.
1000 Sheeting, three threads in the split, warp 22; weft 20.

SECT IV. CALCULATION OF WARPS AND WEFTS.

LINEN YARN.

The length of warps is usually measured by the English ell of 45 inches; and as the linen reel is 90 inches in circumference, one thread or round of it will make a splitful one ell long. A cut, therefore, will produce 6 porters, a heer 12, a hank 72, a hesp 144, and a spyndle 288, as exhibited in the small Table in page 402. Hence, to find the quantity of warp requisite for any web, we have the following

Rule: Multiply the ells by the porters in the web, and divide by 288 for spyndles, 72 for hanks, 12 for heers, or 6 for cuts.

Example 1. How many spyndles will it require to make a web 100 ells long, with 62 porters warp?

100 ells.

62

288)6200(21 sp. 2 hks. $1\frac{1}{3}$ cuts.

576

440

288

72)152(2

144

6)8

$1\frac{1}{3}$

Or if there are 6 heers, or one hank, to be wound on each bobbin, to find the number of bobbins or runners for the warper, divide the product of the porters and ells by 72, and the remainder by 12, for heers.

Example 2. How much warp will it require to make 144 ells of a 1200 seven-eighths clear lawn?

First, 1200×7=8400, and $\frac{8400}{8}$=1050 splits, or 52½ porters; to which may be added, 3 porters more, to uphold the breadth in bleaching, &c. Then,

```
         144
          55
        ----
         720
        720
        ----
        7920
add       72 for the half porter.
        ----
     72)7992(111 hks. or bobbins.
        72
       ----
         79
         72
        ----
          72
          72
         ----
           0
```

To these must be added the allowance for waste in reeling, winding and warping, which, for linen yarn, is commonly 5 per cent.

When the porters and spyndles are given to find the ells, multiply the number 288 by the spyndles, and divide by the porters in the warp.

If I have 20 spyndles of yarn that will answer a 1200 linen, how many ells will it make, allowing $62\frac{1}{2}$ porters?

288
20
$62.5)5760.0(92\frac{4}{25}$ ells.
5625
1350
1250
$100=\frac{4}{25}$

Or thus, 288
20
$62\frac{1}{2}$ 5760
2 2
125)11520(92
1125
270
250
$20=\frac{4}{25}$

But the fraction and four ells more may be deducted for waste, as mentioned above; which will leave 88 ells nett for the length of the web.

If it were required to calculate the warp by the yard of 36 inches, instead of the ell 45, we must substitute the number 360 for 288; for 36 : 45 : : 288 : 360.

Let the first example be resumed, in which 100 ells will produce 125 yards; thus,

125 yards.
62
250
750
$36.0)775.0(21$ sp. 2 hks. $1\frac{1}{3}$ cut, as before.
72
55
36
19
4 hanks.
36)76(2
72
$4=\frac{1}{9}=1\frac{1}{3}$ cutt.

COTTON WARPS.

It has been already shown, that the spyndle of cotton produces 302.4 porters one ell long; consequently, the No. or hank will give 16 porters and 16 splits, or decimally, 16.8. Hence, to find the spyndles when the ells and porters are given,

Multiply the ells and porters together, and divide by 302.4 for spyndles, and the remainder by 16.8 for hanks, and 24 for skeins.

Example 1. How many spyndles will it require for a warp of 146 ells, with 88 porters?

```
              146 ells.
               88 porters.
             ----
             1168
            1168
            -----
     302.4)12848.0(42 sp.  8 hks. 5⅓ skeins.
            12096
            -----
              7520
              6048
              ----
        168)1472(8
            1344
            ----
         24)128(5⅓
             120
            ----
               8=⅓
```

Example 2. How many spyndles will it take to make 100 ells of a web, with 92 porters and 12 splits?

12 splits is $\frac{3}{5}$ of a porter; then,
100
92
———
9200
$\frac{100\times 3}{5}=$ 60 for 12 splits.
———
302.4)9260.0(30 sp. 11 hks. $1\frac{1}{3}$ sk.
9072
———
168)1880(11
168
———
200
168
———
24)32($1\frac{1}{3}$
24
———
8

Or decimally thus, 92.6
100
———
302.4)92600(30, &c.

Or, to avoid fractions, divide the product of the ells and porters by 302, and the remainder by 18, and the result will be sufficiently near for practice.

But if six Nos. or hanks of the warp are to be wound on each bobbin, the number of bobbins, and consequently the quantity of yarn necessary for any cotton web, may be found sufficiently correct, by the following rule:—

Multiply the ells and porters together, as before, and cut off the two right hand figures of the product; then the figures on the left will be the number of bobbins or runners, and those cut off will be the decimal parts of a spyndle.

In the first example, the product of the ells and porters is 12848, which, by cutting off 48, the two right hand figures, gives 128 bobbins and .48 of a fraction, which multiplied by 18 and 7, and the two decimal figures cut off at each product, gives 8 hks. 4½ skeins.

The allowance that is usually made for waste in winding and warping linen yarn, should also be sufficient to uphold cotton warps, though calculated by the rules here laid down; for linen yarn is fully more liable to waste in the different stages of manufacture, than cotton, not only in each operation, but in boiling and washing it shrinks considerably, which cotton yarn is not subject to. Besides, when the yarn is wound from the cops, which saves the loss that takes place in reeling, the allowance for waste should not be so much as above stated. However, as 5 per cent. is commonly allowed for cotton warps as well as linen, they may be calculated by the rules there given, only, instead of dividing by 12 for heers, divide by 16 for hanks or Nos.; although the allowance for waste will depend on the quality of the yarn.

3. For example, the product of the ells and porters in the last Example is 12848; then,

```
288)12848(44 sp. 11 hks.
    1152
    ----
     1328
     1152
     ----
   16)176(11
      16
      --
       16
       16
       --
        0
```

When odd splits occur along with the porters, as in the second Example, they may be reduced to the decimal of a porter by inspection, thus: divide them by 2, supposing a cipher annexed when their number is odd. So the decimal of 12 splits is .6; of 13, is .65, &c. But to avoid decimals, the porters may be reduced to splits, adding the odd ones, and then multiplying by the ells; but the product is to be divided by 20, to reduce them again to porters, before the division takes place.

4. Suppose for a Gingham, 120 ells long, there are 10 porters red, 7 porters and 12 splits blue, 12 porters and 8 splits orange, and 30 porters white; what quantity of warp, of each kind, is requisite for the web?

120
10 Red.
302.4)1200.0(3 sp. 17 hks. 3 sks.
9072
168)2928(17 hks.
168
1248
1176
24)72(3 sks.
72

120
7.6 Blue.
720
840
302.4)912.0(3 sp. 0 hks. 2 sks.
9072
24)48(2
48

120
12.4 Orange.
480
1440.
302.4)1488.0(4 sp. 16 hks. 4 sks.
12096
168)2784(16
168
1104
1008
24)96(4
96

120
30 White.
302.4)3600.0(11 sp.16 hks.2 sks
3024
5760
3024
168)2736(16
168
1056
1008
24)48(2
48

That is,	3 spys.	17 hks.	3 sks.	red.
	3 ...	0 ...	2 ...	blue.
	4 ...	16 ...	4 ...	orange.
	11 ...	16 ...	2 ...	white.
	23 ...	14 ...	4 ...	in all.

For proof, say, as 302.4 : 60 porters : : 120 : 23 sps. 14 hks. 4 sks.

5. To find the quantity of warp, of both kinds, in 99 ells of a 1200 stripe, same as the annexed pattern.

21	5	6	10	6	5	21
splits	splits	splits	splits	splits	splits	splits
fine.	coarse.	fine.	coarse.	fine.	coarse.	fine.

By examining the pattern, it will be found to contain 54 splits fine, and 20 splits coarse, in one set of the draught: their sum is 74. Suppose 93 porters, or 1860 splits warp in the web: then,

74)1860(25
148
———
380
370
———
10 splits over.

To the 10 splits of remainder, 4 more may be added, which will make 14 splits for selvages.

Then 54, the splits of fine in the draught, multiplied by 25, the times the draught is repeated, is 1350, to which add the 14 splits of selvages, and you will have 1364, or 68 porters and 4 splits fine.

Again, as there are nett 20 splits of coarse, the whole of the coarse in the web will be 25 porters.

Then, 68.2 por.
99 ells.
6138
6138
302.4)6751.8(22 sp. 5 hks. 6¼ sks.
6048
7038
6048
168)990(5
840
24)150(6¼
144
6

Again, 99
25
495
198
302.4)2475.0(8 sp. 3 hks. 2¼ sks.
24192
168)558(3
504
24)54(2¼
48
6

But, if the stripes be woven with 4 threads in the split, the spyndles of coarse must be doubled; so that, in the above example, there would be 16 spyndles, 6 hanks, 4½ skeins.

When the porters and spyndles are given to find the ells, multiply the number 302.4 by the spyndles, and divide by the porters in the warps.

Note. In this multiplication, there will always be a decimal in the product, for which there must be a cypher annexed to the divisor.

6. Suppose 24 spyndles of warp and 63 porters, how many ells?

```
        302.4
           24
       ------
        12096
        6048
       ------
63.0)7257.6(115 ells.
       630
       ---
        957
        630
       ----
       3276
       3150
       ----
        126
```

But the fraction and 5 ells may be allowed for waste, as formerly noticed, which will leave 110 ells for the nett length.

To find the number of ells in any bundle of yarn, or quantity of cops, the weight being given, without regarding the spyndles.

Multiply the Nos. of the yarn, the pounds in the quantity of yarn, and the number 16.8 together, for a dividend, and divide by the porters· the result will be the ells in the quantity.

7. How many ells will a 5 lb. bundle of No. 84, or 5 lb. of cops produce, supposing 62 porters?

16.8
84
672
1344
1411.2
5 lb.
62)7056.0(113 ells, answer.
62
85
62
236
186
50

To find what weight of cops will make any web, without regard to the spyndles, the ells, porters, and Nos. of the yarn being given.

Multiply the ells and porters together for a dividend, and the Nos. of the yarn by 16.8, for a divisor; the quotient is the weight required.

8. What weight of cops, No. 120, will make 99 ells of a web, in which there are 93 porters?

93
99
16.8 837
120 837
2016|0) 9207(4 lb.
8064
1143
16 oz.
2016)18288(9
18144
144
16 drams.
864
144
2016)2304(1
2016
288=$\frac{3}{21}$
That is, 4 lb. 9 oz. $1\frac{3}{21}$ drams.

If it were required to calculate the length of warps in yards of 36 inches, the product of the porters and yards is divided by 378 for spyndles; by 21 for Nos. or banks; and by 3 for skeins. For, 36 : 45 : : 302.4 : 378.

Example. Required the warp for 125 yards, with 93 porters?

```
          125 yards.
           93
          ----
          375
         1125
         -----
    378)11625(30 sp. 13 banks. 4 sks.
         1134
         -----
        21)285(13
           21
           ---
            75
            63
           ---
          3)12
           ---
             4
```

In calculating whips, multiply the ells by the number of needles, and divide by 20 for the porters; then proceed as in the foregoing examples.

9. How many spyndles will 800 ells require, with 63 needles?

```
            63
             800
          ------
      2|0)5040|0
          ------
   302.4)2520.0(8 sp. 6 hks.
          24192
          ------
      168)1008(6
          1008
          ----
             0
```

WARP TABLE.

ELLS.

	1.			2.			3.			4.			5.		
	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$
40	0	2	8	0	5	0	0	7	8	0	10	0	0	12	8
41	0	2	9	0	5	2	0	7	11	0	10	4	0	12	13
42	0	2	10	0	5	4	0	7	14	0	10	8	0	13	2
43	0	2	11	0	5	6	0	8	1	0	10	12	0	13	7
44	0	2	12	0	5	8	0	8	4	0	11	0	0	13	12
45	0	2	13	0	5	10	0	8	7	0	11	4	0	14	1
46	0	2	14	0	5	12	0	8	10	0	11	8	0	14	6
47	0	2	15	0	5	14	0	8	13	0	11	12	0	14	11
48	0	3	0	0	6	0	0	9	0	0	12	0	0	15	0
49	0	3	1	0	6	2	0	9	3	0	12	4	0	15	5
50	0	3	2	0	6	4	0	9	6	0	12	8	0	15	10
51	0	3	3	0	6	6	0	9	9	0	12	12	0	15	15
52	0	3	4	0	6	8	0	9	12	0	13	0	0	16	4
53	0	3	5	0	6	10	0	9	15	0	13	4	0	16	9
54	0	3	6	0	6	12	0	10	2	0	13	8	0	16	14
55	0	3	7	0	6	14	0	10	5	0	13	12	0	17	3
56	0	3	8	0	7	0	0	10	8	0	14	0	0	17	8
57	0	3	9	0	7	2	0	10	11	0	14	4	0	17	13
58	0	3	10	0	7	4	0	10	14	0	14	8	1	0	2
59	0	3	11	0	7	6	0	11	1	0	14	12	1	0	7
60	0	3	12	0	7	8	0	11	4	0	15	0	1	0	12
61	0	3	13	0	7	10	0	11	7	0	15	4	1	1	1
62	0	3	14	0	7	12	0	11	10	0	15	8	1	1	6
63	0	3	15	0	7	14	0	11	13	0	15	12	1	1	11
64	0	4	0	0	8	0	0	12	0	0	16	0	1	2	0
65	0	4	1	0	8	2	0	12	3	0	16	4	1	2	5
66	0	4	2	0	8	4	0	12	6	0	16	8	1	2	10
67	0	4	3	0	8	6	0	12	9	0	16	12	1	2	15
68	0	4	4	0	8	8	0	12	12	0	17	0	1	3	4
69	0	4	5	0	8	10	0	12	15	0	17	4	1	3	9
70	0	4	6	0	8	12	0	13	2	0	17	8	1	3	14
71	0	4	7	0	8	14	0	13	5	0	17	12	1	4	3
72	0	4	8	0	9	0	0	13	8	1	0	0	1	4	8
73	0	4	9	0	9	2	0	13	11	1	0	4	1	4	13
74	0	4	10	0	9	4	0	13	14	1	0	8	1	5	2

WARP TABLE.

	ELLS.														
	10.			20.			30.			40.			100.		
	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$
40	1	7	0	2	14	0	4	3	0	5	10	0	13	16	0
41	1	7	10	2	15	4	4	4	14	5	12	8	14	4	4
42	1	8	4	2	16	8	4	6	12	5	15	0	14	10	8
43	1	8	14	2	17	12	4	8	10	5	17	8	14	16	12
44	1	9	8	3	1	0	4	10	8	6	2	0	15	5	0
45	1	10	2	3	2	4	4	12	6	6	4	8	15	11	4
46	1	10	12	3	3	8	4	14	4	6	7	0	15	17	8
47	1	11	6	3	4	12	4	16	2	6	9	8	16	5	12
48	1	12	0	3	6	0	5	0	0	6	12	0	16	12	0
49	1	12	10	3	7	4	5	1	14	6	14	8	17	0	4
50	1	13	4	3	8	8	5	3	12	6	17	0	17	6	8
51	1	13	14	3	9	12	5	5	10	7	1	8	17	12	12
52	1	14	8	3	11	0	5	7	8	7	4	0	18	1	0
53	1	15	2	3	12	4	5	9	6	7	6	8	18	7	4
54	1	15	12	3	13	8	5	11	4	7	9	0	18	13	8
55	1	16	6	3	14	12	5	13	2	7	11	8	19	1	12
56	1	17	0	3	16	0	5	15	0	7	14	0	19	8	0
57	1	17	10	3	17	4	5	16	14	7	16	8	19	14	4
58	2	0	4	4	0	8	6	0	12	8	1	0	20	2	8
59	2	0	14	4	1	12	6	2	10	8	3	8	20	8	12
60	2	1	8	4	3	0	6	4	8	8	6	0	20	15	0
61	2	2	2	4	4	4	6	6	6	8	8	8	21	3	4
62	2	2	12	4	5	8	6	8	4	8	11	0	21	9	8
63	2	3	6	4	6	12	6	10	2	8	13	8	21	15	12
64	2	4	0	4	8	0	6	12	0	8	16	0	22	4	0
65	2	4	10	4	9	4	6	13	14	9	0	8	22	10	4
66	2	5	4	4	10	8	6	15	12	9	3	0	22	16	8
67	2	5	14	4	11	12	6	17	10	9	5	8	23	4	14
68	2	6	8	4	13	0	7	1	8	9	8	0	23	11	0
69	2	7	2	4	14	4	7	3	6	9	10	8	23	17	4
70	2	7	12	4	15	8	7	5	4	9	13	0	24	5	8
71	2	8	6	4	16	12	7	7	2	9	15	8	24	11	12
72	2	9	0	5	0	0	7	9	0	10	0	0	25	0	0
73	2	9	10	5	1	4	7	10	14	10	2	8	25	6	4
74	2	10	4	5	2	8	7	12	12	10	5	0	25	12	8

WARP TABLE.

	ELLS.														
	1.			2.			3.			4.			5.		
	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$
75	0	4	11	0	9	6	0	14	1	1	0	13	1	5	7
76	0	4	12	0	9	8	0	14	4	1	1	0	1	5	12
77	0	4	13	0	9	10	0	14	7	1	1	4	1	6	1
78	0	4	14	0	9	12	0	14	10	1	1	8	1	6	6
79	0	4	15	0	9	14	0	14	13	1	1	12	1	6	11
80	0	5	0	0	10	0	0	15	0	1	2	0	1	7	0
81	0	5	1	0	10	2	0	15	3	1	2	4	1	7	5
82	0	5	2	0	10	4	0	15	6	1	2	8	1	7	10
83	0	5	3	0	10	6	0	15	9	1	2	12	1	7	15
84	0	5	4	0	10	8	0	15	12	1	3	0	1	8	4
85	0	5	5	0	10	10	0	15	15	1	3	4	1	8	9
86	0	5	6	0	10	12	0	16	2	1	3	8	1	8	14
87	0	5	7	0	10	14	0	16	5	1	3	12	1	9	3
88	0	5	8	0	11	0	0	16	8	1	4	0	1	9	8
89	0	5	9	0	11	2	0	16	11	1	4	4	1	9	13
90	0	5	10	0	11	4	0	16	14	1	4	8	1	10	2
91	0	5	11	0	11	6	0	17	1	1	4	12	1	10	7
92	0	5	12	0	11	8	0	17	4	1	5	0	1	10	12
93	0	5	13	0	11	10	0	17	7	1	5	4	1	11	1
94	0	5	14	0	11	12	0	17	10	1	5	8	1	11	6
95	0	5	15	0	11	14	0	17	13	1	5	12	1	11	11
96	0	6	0	0	12	0	1	0	0	1	6	0	1	12	0
97	0	6	1	0	12	2	1	0	3	1	6	4	1	12	5
98	0	6	2	0	12	4	1	0	6	1	6	8	1	12	10
99	0	6	3	0	12	6	1	0	9	1	6	12	1	12	15
100	0	6	4	0	12	8	1	0	12	1	7	0	1	13	4
101	0	6	5	0	12	10	1	0	15	1	7	4	1	13	9
102	0	6	6	0	12	12	1	1	2	1	7	8	1	13	14
103	0	6	7	0	12	14	1	1	5	1	7	12	1	14	3
104	0	6	8	0	13	0	1	1	8	1	8	0	1	14	8
105	0	6	9	0	13	2	1	1	11	1	8	4	1	14	13
106	0	6	10	0	13	4	1	1	14	1	8	8	1	15	2
107	0	6	11	0	13	6	1	2	1	1	8	12	1	15	7
108	0	6	12	0	13	8	1	2	4	1	9	0	1	15	12
109	0	6	13	0	13	10	1	2	7	1	9	4	1	16	1

WARP TABLE.

ELLS.

	10.			20.			30.			40.			100.		
	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$
75	2	10	14	5	3	12	7	14	10	10	7	8	26	0	12
76	2	11	8	5	5	0	7	16	8	10	10	0	26	7	0
77	2	12	2	5	6	4	8	0	6	10	12	8	26	13	4
78	2	12	12	5	7	8	8	2	4	10	15	0	27	1	8
79	2	13	6	5	8	12	8	4	2	10	17	8	27	7	12
80	2	14	0	5	10	0	8	6	0	11	2	0	27	14	0
81	2	14	10	5	11	4	8	7	14	11	4	8	28	2	4
82	2	15	4	5	12	8	8	9	12	11	7	0	28	8	8
83	2	15	14	5	13	12	8	11	10	11	9	8	28	14	12
84	2	16	8	5	15	12	8	13	8	11	12	0	29	3	0
85	2	17	2	5	16	4	8	15	6	11	14	8	29	9	4
86	2	17	12	5	17	8	8	17	4	11	17	0	29	15	8
87	3	0	6	6	0	12	9	1	2	12	1	8	30	3	12
88	3	1	0	6	2	0	9	3	0	12	4	0	30	10	0
89	3	1	10	6	3	4	9	4	14	12	6	8	30	16	4
90	3	2	4	6	4	8	9	6	12	12	9	0	31	4	8
91	3	2	14	6	5	12	9	8	10	12	11	8	31	10	12
92	3	3	8	6	1	0	9	10	8	12	14	0	31	17	0
93	3	4	2	6	8	4	9	12	6	12	16	8	32	5	4
94	3	4	12	6	9	8	9	14	4	13	1	0	32	11	8
95	3	5	6	6	10	12	9	16	2	13	3	8	32	17	12
96	3	6	0	6	12	0	10	0	0	13	6	0	33	6	0
97	3	6	10	6	13	4	10	1	14	13	8	8	33	12	4
98	3	7	4	6	14	8	10	3	12	13	11	0	34	0	8
99	3	7	14	6	15	12	10	5	10	13	13	8	34	6	12
100	3	8	8	6	17	0	10	7	8	13	16	0	34	13	0
101	3	9	2	7	0	4	10	9	6	14	0	8	35	1	4
102	3	9	12	7	1	8	10	11	4	14	3	0	35	7	8
103	3	10	6	7	2	12	10	13	2	14	5	8	35	13	12
104	3	11	0	7	4	0	10	15	0	14	8	0	36	2	0
105	3	11	10	7	5	4	10	16	14	14	10	8	36	8	4
106	3	12	4	7	6	8	11	0	12	14	13	0	36	14	8
107	3	12	14	7	7	12	11	2	10	14	15	8	37	2	12
108	3	13	8	7	9	0	11	4	8	15	0	0	37	9	0
109	3	14	2	7	10	4	11	6	6	15	2	8	37	15	4

WARP TABLE.

ELLS.

	1.			2.			3.			4.			5.		
	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$
110	0	6	14	0	13	12	1	2	10	1	9	8	1	16	6
111	0	6	15	0	13	14	1	2	13	1	9	12	1	16	11
112	0	7	0	0	14	0	1	3	0	1	10	0	1	17	0
113	0	7	1	0	14	2	1	3	3	1	10	4	1	17	5
114	0	7	2	0	14	4	1	3	6	1	10	8	1	17	10
115	0	7	3	0	14	6	1	3	9	1	10	12	1	17	15
116	0	7	4	0	14	8	1	3	12	1	11	0	2	0	4
117	0	7	5	0	14	10	1	3	15	1	11	4	2	0	9
118	0	7	6	0	14	12	1	4	2	1	11	8	2	0	14
119	0	7	7	0	14	14	1	4	5	1	11	12	2	1	3
120	0	7	8	0	15	0	1	4	8	1	12	0	2	1	8
121	0	7	9	0	15	2	1	4	11	1	12	4	2	1	13
122	0	7	10	0	15	4	1	4	14	1	12	8	2	2	2
123	0	7	11	0	15	6	1	5	1	1	12	12	2	2	7
124	0	7	12	0	15	8	1	5	4	1	13	0	2	2	12
125	0	7	13	0	15	10	1	5	7	1	13	4	2	3	1
126	0	7	14	0	15	12	1	5	10	1	13	8	2	3	6
127	0	7	15	0	15	14	1	5	13	1	13	12	2	3	11
128	0	8	0	0	16	0	1	6	0	1	14	0	2	4	0
129	0	8	1	0	16	2	1	6	3	1	14	4	2	4	5
130	0	8	2	0	16	4	1	6	6	1	14	8	2	4	10
131	0	8	3	0	16	6	1	6	9	1	14	12	2	4	15
132	0	8	4	0	16	8	1	6	12	1	15	0	2	5	4
133	0	8	5	0	16	10	1	6	15	1	15	4	2	5	9
134	0	8	6	0	16	12	1	7	2	1	15	8	2	5	14
135	0	8	7	0	16	14	1	7	5	1	15	12	2	6	3
136	0	8	8	0	17	0	1	7	8	1	16	0	2	6	8
137	0	8	9	0	17	2	1	7	11	1	16	4	2	6	13
138	0	8	10	0	17	4	1	7	14	1	16	8	2	7	2
139	0	8	11	0	17	6	1	8	1	1	16	12	2	7	7
140	0	8	12	0	17	8	1	8	4	1	17	0	2	7	12
141	0	8	13	0	17	10	1	8	7	1	17	4	2	8	1
142	0	8	14	0	17	12	1	8	10	1	17	8	2	8	6
143	0	8	15	0	17	14	1	8	13	1	17	12	2	8	11
144	0	9	0	1	0	0	1	9	0	2	0	0	2	9	0

WARP TABLE.

ELLS.

	10.			20.			30.			40.			100.		
	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$	sps.	hks.	$\frac{1}{16}$
110	3	14	12	7	11	8	11	8	4	15	5	0	38	3	8
111	3	15	6	7	12	12	11	10	2	15	7	8	38	9	12
112	3	16	0	7	14	0	11	12	0	15	10	0	38	16	0
113	3	16	10	7	15	4	11	13	14	15	12	8	39	4	4
114	3	17	4	7	16	8	11	15	12	15	15	0	39	10	8
115	3	17	14	7	17	12	11	17	10	15	17	8	39	16	12
116	4	0	8	8	1	0	12	1	8	16	2	0	40	5	0
117	4	1	2	8	2	4	12	3	6	16	4	8	40	11	4
118	4	1	12	8	3	8	12	5	4	16	7	0	40	17	8
119	4	2	6	8	4	12	12	7	2	16	9	8	41	5	12
120	4	3	0	8	6	0	12	9	0	16	12	0	41	12	0
121	4	3	10	8	7	4	12	10	14	16	14	8	42	0	4
122	4	4	4	8	8	8	12	12	12	16	17	0	42	6	8
123	4	4	14	8	9	12	12	14	10	17	1	8	42	12	12
124	4	5	8	8	11	0	12	16	8	17	4	0	43	1	0
125	4	6	2	8	12	4	13	0	6	17	6	8	43	7	4
126	4	6	12	8	13	8	13	2	4	17	9	0	43	13	8
127	4	7	6	8	14	12	13	4	2	17	11	8	44	1	12
128	4	8	0	8	16	0	13	6	0	17	14	0	44	8	0
129	4	8	10	8	17	4	13	7	14	17	16	8	44	14	4
130	4	9	4	9	0	8	13	9	12	18	1	0	45	2	8
131	4	9	14	9	1	12	13	11	18	18	3	8	45	8	12
132	4	10	8	9	3	0	13	13	8	18	6	0	45	15	0
133	4	11	2	9	4	4	13	15	6	18	8	8	46	3	4
134	4	11	12	9	5	8	13	17	4	18	11	0	46	9	8
135	4	12	6	9	6	12	14	1	2	18	13	8	46	15	12
136	4	13	0	9	8	0	14	3	0	18	16	0	47	4	0
137	4	13	10	9	9	4	14	4	14	19	0	8	47	10	4
138	4	14	4	9	10	8	14	6	12	19	3	0	47	16	8
139	4	14	14	9	11	12	14	8	10	19	5	8	48	4	12
140	4	15	8	9	13	0	14	10	8	19	8	0	48	11	0
141	4	16	2	9	14	4	14	12	6	19	10	8	48	17	4
142	4	16	12	9	15	8	14	14	4	19	13	0	49	5	8
143	4	17	6	9	16	12	14	16	2	19	15	8	49	11	12
144	5	0	0	10	0	0	15	0	0	20	0	0	50	0	0

CALCULATION OF WEFTS.

The quantity of warp in any web or piece of cloth can be found by the rules already given, to any degree of accuracy; but the same accuracy in the calculation of wefts is not so easily obtained: for this process depends, in general, on the number of shots on the glass, which, as already observed, is contained 5.4 times in an inch for reeds on 37 inches; and therefore, a fractional part of a shot, which cannot be well ascertained, may amount to a considerable error in the length of a web. Thus, for instance, if there were 36 spyndles of warp in a web woven in a 1200 reed, and counting 12 shots on the glass, it would be presumed that there were 36 spyndles of weft also. If 13 shots, that there were a twelfth more, or 39 spyndles; and if only 11, a twelfth less or 33; being 3 spyndles of difference for each shot. Hence it is evident that when a larger measure can be easily applied, the risk of error would be thereby diminished, so that an inch, for example, would reduce such errors in the ratio of 5.4 to 1.

When the number of shots on the glass and the breadth of the cloth are given, the quantity of weft on one yard will be found by the following rule:—

Multiply the shots on the glass, the inches in the breadth, and the number 5.4 together, and divide by the number of yards in a skein, heer, hank, or spyndle.

Or, when the number of shots in an inch can be ascertained, multiply the shots in an inch, by the inches in the breadth, and divide as above.

Example. Suppose a piece of cloth 60 inches broad, with 18 shots on the glass, to find the Nos. and skeins in a yard, allowing 5 per cent. off the cotton reel for waste.

In the small Table, page 407, it will be found that there are 120 yards in a skein, and 840 in a No. or hank; which after deducting 5 per cent. will leave 114 for the former, and 798 for the latter.

```
Then, 5.4
        60
     ------
      324.0
        18
     ------                          Or thus,
     25920                            798)5832.0(7 Nos. 3 sks.
     3240  skeins.                        5486
     ------                               ----
  114)5832.0(51.15                    114)346
     570                                  732
     ----                                 ----
     132                                    4
     114
      ---
      180
      114
      ---
      660
      570
      ---
       90
```

But the quantity of weft will be found more readily by the following Table. The breadths in inches run along the top, from 28 to 63 inclusive, the shots on the glass in the left, and the corresponding shots on an inch in the right hand columns. In the body of the Table, below each breadth, are two columns, in the first of which are the yards and hundredth parts of a yard produced from one spyndle, corresponding to the several breadths and number of shots. The second contains the fractional parts of a spyndle on one yard.

Although these fractions be all reduced to decimals, for the sake of ease and accuracy of computation; yet, by attending to the following directions, the use of the Table, it is presumed, will be sufficiently understood, even by those who have no previous knowledge of decimal arithmetic.

First, when the number of yards are required which one spyndle of weft will produce, they will be found under the breadth of the cloth on the top, and on a line with the number of shots on the glass, in the left hand column. Thus, for example, under 37 inches, and opposite 16 shots, will be found 4.50; which shows that one spyndle of weft will produce 4 yards of cloth, and 50 hundredth parts, or 4½ yards of the above breadth and thickness.

But, if the number of yards be required from more spyndles than one, multiply the number of yards thus found, by the spyndles, and cut off the two right hand figures from the product; the figures on the left are yards, and those on the right are hundredth parts, as above.

FOR EXAMPLE.

To find the number of yards 40 inches broad, with 15 shots on the glass, which 24 spyndles will weft; look in the first column, below 40 inches, and on a line with 15 shots will be found

	4.44
Which multiplied by	24
	1776
	888
is	106.56

That is, 106 yards and 56 hundredth parts of a yard, or half a yard nearly.

Secondly, when the quantity of weft on one yard of cloth is required, it will be found in the second column, below the breadth, and opposite the number of shots on the glass. Thus, supposing the cloth 38 inches broad, and 17 shots, at an average, on the glass, the number found in the table will be .2425, for the fractional part of a spyndle; which may be reduced to Nos. and skeins, by multiplying by 18 and 7; and cutting off four figures from the right of each product, as in the following example:—

EXAMPLE.

Suppose the quantity of weft on 39 yards of cloth of the above description, were required; then,

	.2425
Multiplied by	39
	21825
	7275
Spyndles,	9.4575
	18
Nos.	36600
	4575
Skeins,	8.2350
	7
	1.6450

That is 9 spyndles, 8 Nos. and 1⅝ skeins nearly.

If the cloth be unevenly woven, or thicker in one part than another, take the number of shots on the glass in different parts, where it is thickest and thinest, and add them all together; then, their sum divided by the number of times the cloth was glassed, will give, at an average, the shots on the glass. Thus, if there are 12 shots on one part, 15 on another, 13 on a third, and 14 on a fourth; then, 12, 15, 13 and 14 added together, is 54, which divided by 4, gives 13½ shots for the average thickness. And if the numbers opposite to 13 and 14 shots be added together, and divided by 2, the result will be the quantity answering to 13½ shots.

If there be not an exact number of shots on the glass, as will often be the case in coarse cloth, count the shots on ⅘ths of an inch, and divide them by 4, and the quotient will give the number of shots on the glass more accurately. Thus, suppose there are more than 7, and less than 8 shots on the extent of the glass, but it is found that there are 29 on ⅘ths of an inch; then 29 divided by 4, will give 7¼ shots for the average which may be proportioned for, as in the last example.

If the breadth of the cloth should exceed the extent of this table, any two breadths may be taken, which will make up the breadth in question; observing, when the numbers under spyndles in a yard are to be added, those under yards in a spyndle are to be subtracted.

Example. Suppose it were required to find the number of yards produced from one spyndle, and the quantity of weft on one yard of cloth 65 inches broad, and 14 shots on the glass. Here it will easily be observed that 28 and 37 inches will make the given breadth. Then the yards in a spyndle under 28 inches, and opposite 14 shots, are 6.79 and those under 37 inches, and on a line with 14 shots are 5.14; then,

$$\begin{array}{r} 6.79 \\ 5.14 \\ \hline 1.65 \end{array}$$

That is 1 yard and .65 hundredth parts.

Again, in the column under spyndles on a yard, for 37 inches is .1944, and for 28 is .1471; their sum, which is .3415, is the fractional parts of a spyndle for 65 inches broad.

If the breadth of the cloth should not be found on the head of the table, a proportional part of the difference between the numbers in the adjacent columns may be taken: by these means the quantity of weft on any piece of cloth may be ascertained to any degree of accuracy.

Thus, suppose 38¾ inches instead of 38 in the preceding example, to find the weft on 39 yards with 19 shots on the glass.

In the table for 39 inches, is .2488
for 38 .2425

difference, 63
¾ths 3

4)189

47
Added to 38 .2425
gives 38¾ inches. .2472

which multiplied by 18 and 7, will give the quantity of weft as before.

Note. This table is calculated for the cotton standard, with an allowance of one spyndle to 20 for waste; so that, if applied to linen cloth, an additional allowance of 5 per cent. must be made.

WEFT TABLE.

Shots on the glass.	28 inches.		29 inches.		30 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	23.79	.0420	22.96	.0435	22.20	.0450	21
5	19.03	.0525	18.37	.0544	17.76	.0563	27
6	15.86	.0631	15.31	.0653	14.80	.0675	32
7	13.59	.0736	13.12	.0762	12.68	.0788	38
8	11.90	.0841	11.48	.0871	11.10	.0901	43
9	10.57	.0946	10.21	.0980	9.87	.1013	46
10	9.51	.1051	9.18	.1088	8.88	.1126	54
11	8.65	.1156	8.35	.1197	8.07	.1239	59
12	7.93	.1261	7.65	.1306	7.40	.1351	65
13	7.32	.1366	7.07	.1415	6.83	.1464	70
14	6.79	.1471	6.56	.1524	6.34	.1576	76
15	6.34	.1576	6.12	.1633	5.92	.1689	81
16	6.95	.1682	5.74	.1742	5.55	.1802	86
17	6.60	.1787	5.40	.1851	5.22	.1914	92
18	5.28	.1892	5.10	.1959	4.93	.2027	97
19	5.01	.1997	4.83	.2068	4.67	.2139	103
20	4.75	.2102	4.59	.2177	4.44	.2252	108
21	4.53	.2207	4.37	.2286	4.23	.2365	113
22	4.32	.2312	4.17	.2395	4.03	.2477	119
23	4.13	.2417	3.99	.2504	3.86	.2590	124
24	3.96	.2522	3.82	.2613	3.70	.2703	130
25	3.80	.2627	3.67	.2721	3.55	.2815	135
26	3.66	.2733	3.53	.2830	3.41	.2923	140
27	3.52	.2838	3.40	.2939	3.29	.3040	146
28	3.39	.2943	3.28	.3048	3.17	.3153	151
29	3.28	.3048	3.16	.3157	3.06	.3266	157
30	3.17	.3153	3.06	.3266	2.96	.3378	162
31	3.07	.3258	2.96	.3375	2.86	.3491	167
32	2.97	.3363	2.87	.3483	2.77	.3603	173

WEFT TABLE CONTINUED.

Shots on the glass.	31 inches.		32 inches.		33 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	21.48	.0465	20.81	.0481	20.18	.0495	21
5	17.19	.0582	16.65	.0601	16.14	.0619	27
6	14.32	.0698	13.87	.0721	13.45	.0743	32
7	12.27	.0814	11.89	.0841	11.54	.0867	38
8	10.74	.0931	10.40	.0961	10.09	.0991	43
9	9.55	.1046	9.25	.1081	8.97	.1115	46
10	8.59	.1164	8.32	.1201	8.07	.1239	54
11	7.81	.1280	7.56	.1321	7.34	.1362	59
12	7.16	.1396	6.94	.1441	6.73	.1486	65
13	6.61	.1513	6.41	.1561	6.21	.1610	70
14	6.13	.1629	5.94	.1681	5.76	.1734	76
15	5.73	.1745	5.55	.1802	5.38	.1858	81
16	5.37	.1862	5.20	.1922	5.05	.1982	86
17	5.05	.1978	4.90	.2042	4.74	.2106	92
18	4.77	.2094	4.62	.2162	4.48	.2229	97
19	4.52	.2211	4.38	.2282	4.25	.2353	103
20	4.30	.2327	4.16	.2402	4.03	.2477	108
21	4.09	.2443	3.96	.2522	3.84	.2601	113
22	3.90	.2560	3.78	.2642	3.67	.2725	119
23	3.73	.2676	3.62	.2763	3.51	.2849	124
24	3.58	.2792	3.47	.2883	3.36	.2973	130
25	3.44	.2909	3.33	.3003	3.23	.3097	135
26	3.30	.3025	3.20	.3123	3.10	.3221	140
27	3.18	.3142	3.08	.3243	2.99	.3344	146
28	3.06	.3258	2.97	.3363	2.88	.3468	151
29	2.96	.3374	2.87	.3483	2.78	.3592	157
30	2.86	.3491	2.77	.3603	2.69	.3716	162
31	2.77	.3607	2.68	.3723	2.60	.3840	167
32	2.68	.3723	2.60	.3843	2.52	.3964	173

WEFT TABLE CONTINUED.

Shots on the glass.	34 inches.		35 inches.		36 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	19.59	.0511	19.12	.0525	18.50	.0540	21
5	15.67	.0638	15.22	.0657	14.80	.0675	27
6	13.06	.0766	12.68	.0788	12.33	.0811	32
7	11.19	.0893	10.87	.0919	10.57	.0946	38
8	9.79	.1021	9.51	.1051	9.25	.1081	43
9	8.71	.1149	8.45	.1182	8.22	.1216	46
10	7.83	.1276	7.61	.1314	7.40	.1351	54
11	7.12	.1404	6.92	.1445	6.72	.1486	59
12	6.53	.1531	6.34	.1576	6.17	.1621	65
13	6.03	.1659	5.86	.1708	5.69	.1756	70
14	5.59	.1787	5.43	.1839	5.28	.1892	76
15	5.22	.1914	5.07	.1971	4.93	.2027	81
16	4.90	.2042	4.76	.2102	4.62	.2162	86
17	4.61	.2170	4.48	.2233	4.35	.2297	92
18	4.35	.2297	4.23	.2365	4.11	.2432	97
19	4.12	.2425	4.00	.2496	3.89	.2567	103
20	3.91	.2552	3.80	.2627	3.70	.2702	108
21	3.73	.2680	3.62	.2759	3.52	.2837	113
22	3.56	.2808	3.46	.2890	3.36	.2973	119
23	3.40	.2935	3.31	.3027	3.22	.3108	124
24	3.26	.3061	3.17	.3153	3.08	.3243	130
25	3.13	.3191	3.04	.3284	2.96	.3378	135
26	3.01	.3318	2.93	.3416	2.84	.3518	140
27	2.90	.3446	2.82	.3547	2.74	.3648	146
28	2.79	.3573	2.71	.3678	2.64	.3783	151
29	2.70	.3701	2.62	.3810	2.55	.3918	157
30	2.61	.3829	2.53	.3941	2.46	.4054	162
31	2.53	.3956	2.45	.4073	2.38	.4189	167
32	2.45	.4084	2.38	.4204	2.31	.4324	173

WEFT TABLE CONTINUED.

Shots on the glass.	37 inches.		38 inches.		39 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	18.00	.0555	17.52	.0570	17.08	.0585	21
5	14.40	.0694	14.02	.0713	13.66	.0732	27
6	12.00	.0883	11.68	.0856	11.38	.0878	32
7	10.28	.0972	10.02	.0998	9.76	.1024	38
8	9.00	.1111	8.76	.1141	8.54	.1171	43
9	8.00	.1250	7.79	.1283	7.59	.1317	46
10	7.20	.1388	7.01	.1426	6.83	.1464	54
11	6.54	.1527	6.37	.1569	6.21	.1610	59
12	6.00	.1666	5.84	.1711	5.69	.1756	65
13	5.54	.1805	5.40	.1854	5.25	.1963	70
14	5.14	.1944	5.10	.1997	4.88	.2049	76
15	4.80	.2083	4.67	.2140	4.55	.2169	81
16	4.50	.2222	4.38	.2282	4.27	.2342	86
17	4.23	.2361	4.12	.2425	4.02	.2488	92
18	4.00	.2500	3.89	.2567	3.79	.2635	97
19	3.79	.2638	3.69	.2710	3.60	.2781	103
20	3.60	.2777	3.50	.2853	3.41	.2928	108
21	3.43	.2916	3.34	.2995	3.25	.3074	113
22	3.27	.3055	3.18	.3138	3.10	.3220	119
23	3.13	.3194	3.05	.3280	2.97	.3367	124
24	3.00	.3333	2.92	.3423	2.84	.3513	130
25	2.88	.3472	2.80	.3566	2.73	.3659	135
26	2.97	.3611	2.70	.3708	2.62	.3806	140
27	2.66	.3750	2.60	.3851	2.53	.3952	146
28	2.57	.3888	2.50	.3994	2.44	.4099	151
29	2.48	.4027	2.41	.4136	2.35	.4245	157
30	2.40	.4166	2.33	.4280	2.27	.4391	162
31	2.32	.4305	2.26	.4422	2.20	.4539	167
32	2.25	.4444	2.19	.4564	2.13	.4684	173

WEFT TABLE CONTINUED.

Shots on the glass.	40 inches.		41 inches.		42 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	16.65	.0600	16.24	.0615	15.86	.0630	21
5	13.32	.0750	13.00	.0769	12.68	.0788	27
6	11.10	.0912	10.83	.0923	10.57	.0946	32
7	9.51	.1054	9.28	.1077	9.06	.1103	38
8	8.32	.1201	8.12	.1231	7.93	.1261	43
9	7.40	.1351	7.22	.1385	7.05	.1419	46
10	6.66	.1501	6.50	.1539	6.34	.1576	54
11	6.05	.1651	5.90	.1693	5.76	.1734	59
12	5.55	.1801	5.41	.1847	5.28	.1892	65
13	5.12	.1952	5.00	.2000	4.88	.2050	70
14	4.75	.2102	4.64	.2154	4.53	.2207	76
15	4.44	.2252	4.33	.2308	4.23	.2364	81
16	4.16	.2402	4.06	.2462	3.96	.2522	86
17	3.92	.2552	3.82	.2616	3.73	.2680	92
18	3.70	.2702	3.61	.2770	3.52	.2837	97
19	3.50	.2853	3.42	.2924	3.34	.2995	103
20	3.33	.3003	3.25	.3078	3.37	.3153	108
21	3.14	.3153	3.09	.3232	3.02	.3310	113
22	3.02	.3303	2.95	.3386	2.88	.3468	119
23	2.89	.3453	2.82	.3540	2.76	.3626	124
24	2.77	.3603	2.70	.3693	2.64	.3783	130
25	2.66	.3753	2.60	.3847	2.54	.3941	135
26	2.56	.3904	2.50	.4001	2.44	.4099	140
27	2.46	.4054	2.40	.4155	2.35	.4256	146
28	2.37	.4204	2.32	.4309	2.26	.4414	151
29	2.29	.4354	2.24	.4463	2.18	.4571	157
30	2.22	.4504	2.16	.4617	2.11	.4729	162
31	2.15	.4654	2.09	.4771	2.05	.4887	167
32	2.08	.4805	2.03	.4925	1.98	.5044	173

WEFT TABLE CONTINUED.

Shots on the glass.	43 inches.		44 inches.		45 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	15.49	.0645	15.13	.0660	14.80	.0675	21
5	12.39	.0807	12.11	.0824	11.84	.0844	27
6	10.32	.0968	10.09	.0988	9.82	.1043	32
7	8.85	.1130	8.65	.1153	8.46	.1182	38
8	7.74	.1291	7.57	.1318	7.40	.1351	43
9	6.88	.1452	6.73	.1483	6.58	.1520	46
10	6.19	.1614	6.05	.1648	5.92	.1689	54
11	5.63	.1775	5.50	.1812	5.38	.1858	59
12	5.16	.1937	5.04	.1977	4.93	.2027	65
13	4.77	.2098	4.66	.2142	4.55	.2196	70
14	4.42	.2260	4.32	.2307	4.23	.2364	76
15	4.13	.2421	4.04	.2471	3.94	.2533	81
16	3.87	.2582	3.78	.2636	3.70	.2702	86
17	3.64	.2744	3.56	.2801	3.48	.2871	92
18	3.44	.2905	3.36	.2966	3.39	.3040	97
19	3.26	.3066	3.18	.3131	3.11	.3210	103
20	3.10	.3228	3.02	.3295	2.96	.3378	108
21	2.95	.3390	2.88	.3460	2.82	.3547	113
22	2.81	.3551	2.75	.3625	2.69	.3716	119
23	2.69	.3712	2.63	.3790	2.57	.3885	124
24	2.58	.3874	2.52	.3954	2.46	.4053	130
25	2.48	.4035	2.42	.4120	2.37	.4222	135
26	2.38	.4196	2.33	.4284	2.27	.4391	140
27	2.29	.4358	2.24	.4450	2.19	.4560	146
28	2.21	.4520	2.16	.4613	2.11	.4730	151
29	2.13	.4681	2.08	.4778	2.04	.4898	157
30	2.06	.4842	2.02	.4943	1.97	.5067	162
31	2.00	.5008	1.95	.5108	1.91	.5236	167
32	1.93	.5165	1.89	.5273	1.85	.5405	173

WEFT TABLE CONTINUED.

Shots on the glass.	46 inches.		47 inches.		48 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	14.48	.0690	14.17	.0705	13.97	.0720	21
5	11.58	.0863	11.33	.0882	11.10	.0901	27
6	9.65	.1036	9.44	.1058	9.25	.1081	32
7	8.27	.1208	8.10	.1235	7.93	.1261	38
8	7.24	.1381	7.08	.1411	6.94	.1441	43
9	6.43	.1554	6.39	.1587	6.16	.1621	46
10	5.79	.1726	5.67	.1764	5.55	.1802	54
11	5.26	.1900	5.15	.1940	5.04	.1982	59
12	4.82	.2072	4.72	.2117	4.62	.2162	65
13	4.45	.2244	4.36	.2293	4.27	.2342	70
14	4.13	.2417	4.05	.2470	3.96	.2522	76
15	3.86	.2590	3.78	.2646	3.70	.2702	81
16	3.62	.2762	3.54	.2822	3.47	.2883	86
17	3.41	.2935	3.34	.3000	3.27	.3063	92
18	3.21	.3108	3.15	.3175	3.08	.3243	97
19	3.05	.3280	2.98	.3352	2.92	.3423	103
20	2.89	.3453	2.83	.3528	2.77	.3603	108
21	2.76	.3626	2.70	.3705	2.64	.3783	113
22	2.63	.3798	2.57	.3881	2.52	.3964	119
23	2.52	.3971	2.46	.4057	2.41	.4144	124
24	2.41	.4144	2.36	.4234	2.31	.4324	130
25	2.31	.4316	2.26	.4410	2.22	.4504	135
26	2.22	.4489	2.18	.4587	2.13	.4684	140
27	2.14	.4662	2.10	.4763	2.06	.4865	146
28	2.06	.4834	2.02	.4940	1.98	.5045	151
29	2.00	.5007	1.95	.5116	1.91	.5225	157
30	1.93	.5180	1.89	.5292	1.85	.5405	162
31	1.87	.5352	1.83	.5469	1.79	.5585	167
32	1.81	.5525	1.77	.5645	1.73	.5765	173

WEFT TABLE CONTINUED.

Shots on the glass.	49 inches.		50 inches.		51 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	13.59	.0735	13.32	.0750	13.05	.0765	21
5	10.87	.0919	10.65	.0938	10.44	.0957	27
6	9.06	.1103	8.88	.1162	8.70	.1148	32
7	7.77	.1287	7.61	.1313	7.46	.1340	38
8	6.79	.1471	6.66	.1501	6.53	.1531	43
9	6.03	.1655	5.92	.1689	5.80	.1723	46
10	5.43	.1839	5.33	.1877	5.22	.1914	54
11	4.94	.2023	4.84	.2064	4.75	.2105	59
12	4.53	.2207	4.44	.2252	4.35	.2297	65
13	4.18	.2391	4.10	.2440	4.02	.2488	70
14	3.88	.2575	3.80	.2627	3.73	.2680	76
15	3.62	.2759	3.55	.2815	3.48	.2871	81
16	3.39	.2943	3.33	.3003	3.27	.3063	86
17	3.20	.3127	3.13	.3190	3.07	.3254	92
18	3.02	.3311	2.96	.3378	2.90	.3446	97
19	2.86	.3494	2.80	.3566	2.75	.3637	103
20	2.71	.3678	2.66	.3753	2.61	.3829	108
21	2.59	.3862	2.53	.3941	2.49	.4020	113
22	2.47	.4046	2.42	.4129	2.37	.4211	119
23	2.36	.4230	2.31	.4316	2.27	.4403	124
24	2.26	.4414	2.22	.4504	2.17	.4594	130
25	2.17	.4598	2.13	.4692	2.09	.4786	135
26	2.09	.4782	2.05	.4880	2.01	.4977	140
27	2.01	.4966	1.97	.5067	1.93	.5169	146
28	1.94	.5150	1.90	.5255	1.86	.5360	151
29	1.87	.5334	1.83	.5442	1.80	.5551	157
30	1.81	.5518	1.77	.5630	1.74	.5743	162
31	1.75	.5701	1.72	.5818	1.68	.5934	167
32	1.69	.5885	1.66	.6005	1.63	.6126	173

WEFT TABLE CONTINUED.

Shots on the glass.	52 inches.		53 inches.		54 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	12.80	.0780	12.56	.0796	12.33	.0811	21
5	10.24	.0976	10.05	.0994	9.86	.1013	27
6	8.54	.1171	8.37	.1193	8.24	.1216	32
7	7.32	.1366	7.18	.1392	7.05	.1419	38
8	6.40	.1561	6.28	.1591	6.16	.1621	43
9	5.69	.1756	5.58	.1790	5.86	.1824	46
10	5.12	.1952	5.03	.1989	4.93	.2027	54
11	4.65	.2147	4.57	.2188	4.48	.2230	59
12	4.27	.2342	4.18	.2387	4.11	.2432	65
13	3.94	.2537	3.87	.2586	3.79	.2635	70
14	3.66	.2732	3.59	.2785	3.52	.2838	76
15	3.41	.2928	3.35	.2984	3.29	.3040	81
16	3.20	.3123	3.14	.3183	3.08	.3243	86
17	3.01	.3318	2.95	.3382	2.90	.3446	92
18	2.84	.3513	2.79	.3581	2.74	.3649	97
19	2.69	.3708	2.64	.3780	2.59	.3851	103
20	2.56	.3904	2.51	.3979	2.46	.4054	108
21	2.44	.4099	2.39	.4178	2.35	.4256	113
22	2.32	.4294	2.28	.4377	2.24	.4460	119
23	2.23	.4489	2.18	.4576	2.14	.4662	124
24	2.13	.4684	2.09	.4775	2.05	.4865	130
25	2.05	.4879	2.02	.4973	1.97	.5087	135
26	1.97	.5075	1.93	.5172	1.89	.5270	140
27	1.89	.5270	1.86	.5371	1.82	.5473	146
28	1.83	.5465	1.79	.5570	1.76	.5675	151
29	1.76	.5660	1.73	.5769	1.70	.5878	157
30	1.70	.5855	1.67	.5968	1.64	.6081	162
31	1.65	.6051	1.62	.6167	1.59	.6283	167
32	1.60	.6246	1.57	.6366	1.54	.6486	173

WEFT TABLE CONTINUED.

Shots on the glass.	55 inches.		56 inches.		57 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	12.11	.0825	11.89	.0841	11.68	.0856	21
5	9.68	.1033	9.51	.1051	9.34	.1070	27
6	8.07	.1238	7.92	.1261	7.78	.1283	32
7	6.92	.1445	6.80	.1471	6.67	.1497	38
8	6.05	.1651	5.94	.1681	5.84	.1711	43
9	5.38	.1857	5.62	.1892	5.19	.1925	46
10	4.84	.2064	4.75	.2102	4.67	.2140	54
11	4.40	.2270	4.32	.2312	4.25	.2353	59
12	4.03	.2477	3.95	.2522	3.89	.2567	65
13	3.72	.2683	3.66	.2732	3.59	.2781	70
14	3.46	.2890	3.39	.2943	3.33	.2995	76
15	3.23	.3096	3.17	.3153	3.11	.3209	81
16	3.02	.3302	2.97	.3363	2.92	.3432	86
17	2.85	.3509	2.79	.3573	2.75	.3637	92
18	2.69	.3715	2.64	.3783	2.59	.3851	97
19	2.55	.3921	2.50	.3994	2.46	.4065	103
20	2.42	.4128	2.38	.4204	2.33	.4279	108
21	2.30	.4334	2.26	.4414	2.22	.4493	113
22	2.20	.4541	2.16	.4624	2.12	.4707	119
23	2.10	.4747	2.06	.4834	2.03	.4921	124
24	2.01	.4953	1.98	.5045	1.94	.5135	130
25	1.93	.5160	1.90	.5255	1.87	.5349	135
26	1.86	.5366	1.83	.5465	1.79	.5563	140
27	1.79	.5573	1.76	.5675	1.73	.5777	146
28	1.73	.5780	1.70	.5885	1.69	.5991	151
29	1.67	.5985	1.64	.6096	1.61	.6201	157
30	1.61	.6192	1.58	.6306	1.55	.6419	162
31	1.56	.6398	1.53	.6566	1.50	.6632	167
32	1.51	.6605	1.48	.6726	1.46	.6846	173

WEFT TABLE CONTINUED.

Shots on the glass.	58 inches.		59 inches.		60 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	11.48	.0871	11.29	.0886	11.10	.0900	21
5	9.18	.1089	9.03	.1108	8.88	.1126	27
6	7.65	.1306	7.52	.1328	7.40	.1340	32
7	6.56	.1524	6.45	.1540	6.34	.1576	38
8	5.74	.1741	5.64	.1772	5.55	.1802	43
9	5.10	.1959	5.01	.1992	4.93	.2026	46
10	4.59	.2177	4.51	.2214	4.44	.2252	54
11	4.17	.2394	4.10	.2436	4.03	.2478	59
12	3.82	.2612	3.76	.2658	3.70	.2702	65
13	3.53	.2830	3.48	.2878	3.41	.2928	70
14	3.28	.3048	3.22	.3100	3.17	.3152	76
15	3.06	.3265	3.01	.3322	2.96	.3378	81
16	2.87	.3483	2.82	.3544	2.78	.3604	86
17	2.70	.3701	2.65	.3766	2.61	.3828	92
18	2.55	.3918	2.51	.3986	2.46	.4054	97
19	2.41	.4136	2.38	.4208	2.33	.4278	103
20	2.29	.4354	2.25	.4430	2.22	.4504	108
21	2.18	.4571	2.15	.4650	2.11	.4730	113
22	2.01	.4789	2.05	.4872	2.01	.4954	119
23	1.98	.5007	1.96	.5094	1.93	.5180	124
24	1.91	.5225	1.88	.5316	1.35	.5406	130
25	1.83	.5442	1.80	.5536	1.78	.5630	135
26	1.76	.5660	1.73	.5758	1.70	.5846	140
27	1.70	.5878	1.67	.5980	1.64	.6080	146
28	1.64	.6095	1.61	.6202	1.58	.6306	151
29	1.58	.6313	1.55	.6422	1.53	.6532	157
30	1.53	.6531	1.50	.6644	1.48	.6756	162
31	1.48	.6748	1.45	.6866	1.43	.6982	167
32	1.43	.6971	1.41	.7088	1.38	.7206	173

WEFT TABLE CONTINUED.

Shots on the glass.	61 inches.		62 inches.		63 inches.		Shots on inch.
	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	Yards from a spyndle.	Parts of a spyndle.	
4	10.91	.0916	10.74	.0930	10.57	.0946	21
5	8.73	.1144	8.59	.1164	8.45	.1182	27
6	7.28	.1374	7.16	.1396	7.04	.1418	32
7	6.24	.1603	6.13	.1628	6.04	.1654	38
8	5.45	.1832	5.37	.1862	5.28	.1852	43
9	4.85	.2060	4.78	.2092	4.70	.2128	46
10	4.36	.2290	4.29	.2328	4.22	.2364	54
11	3.97	.2518	3.90	.2560	3.84	.2602	59
12	3.63	.2758	3.58	.2792	3.52	.2838	65
13	3.36	.2976	3.30	.3026	3.25	.3074	70
14	3.11	.3206	3.06	.3258	3.02	.3310	76
15	2.91	.3434	2.86	.3490	2.82	.3546	81
16	2.73	.3664	2.68	.3724	2.64	.3784	86
17	2.57	.3892	2.52	.3956	2.48	.4020	92
18	2.42	.4122	2.38	.4188	2.35	.4246	97
19	2.30	.4350	2.26	.4422	2.22	.4492	103
20	2.18	.4580	2.15	.4654	2.11	.4730	108
21	2.08	.4808	2.04	.4886	2.01	.4964	113
22	1.90	.5036	1.95	.5120	1.92	.5200	119
23	1.98	.5266	1.86	.5352	1.84	.5438	124
24	1.81	.5496	1.79	.5584	1.76	.5676	130
25	1.74	.5724	1.72	.5818	1.69	.5912	135
26	1.68	.5954	1.65	.6050	1.62	.6148	140
27	1.61	.6182	1.59	.6284	1.56	.6384	146
28	1.55	.6412	1.53	.6516	1.51	.6622	151
29	1.50	.6640	1.48	.6748	1.45	.6858	157
30	1.45	.6870	1.43	.6982	1.41	.7094	162
31	1.40	.7098	1.38	.7214	1.36	.7330	167
32	1.36	.7326	1.34	.7446	1.32	.7766	173

To find the quantity of weft or spotting on any number of lashes, having also the breadth of the cloth.

Multiply together the number of lashes, the shots on each lash, and the inches broad, and divide, first by 36, the inches in a yard, and again by the number of yards in a spyndle, abating the allowance for waste.

EXAMPLE.

How much weft on 126000 lashes, 2 shots on each lash, and 54 inches broad?

126000
54

504000
630000

6804000
2

36)13608000(378000
108

280
252

288
288

0

spyndles.
and 1368|0)37800|0(27.63
2736

10440
9576

8640
8208

4320
4104

216

In the spyndle of linen yarn there are 14400 yards, 5 per cent. off which, leaves 13680 for the last divisor; and the quotient is 27 spyndles and 63 hundred parts.

The following table, for which I am indebted to Mr. D. M'Nicol, Paisley, will be found useful for ascertaining the quantity of weft or spotting on any number of lashes from one to a million, and breadths from 40 to 72 inches. It is calculated for 2 shots on the lash, with an allowance of 5 per cent. off the linen standard, which is equal to 10 per cent. off the cotton. The number of lashes run along the top, and increase or decrease in a ten-fold proportion. The body of the table contains the spyndles and decimal parts of a spyndle, and follows the same proportion as the lashes, merely by moving the decimal point to the right or left, one figure for 10, two for 100, &c.—thus,

900000 lashes, at 40 inches broad, is = 145.8 spyndles.
90000 — — — — = 14.58
9000 — — — — = 1.458
900 — — — — = .1458
90 — — — — = .01458
9 — — — — = .001458

EXAMPLE.

Suppose, as above, 126000 lashes, and the breadth 54 inches—then,

100000 lashes = 21.87
20000 — = 4.374
6000 — = 1.312

27.556

That is, 27 spyndles, and a little more than a half.

Note. In these calculations allowance must be made for catch cords when they are employed, which, in general, is about 100 splits.

If there had been 4 shots on each lash, this quantity would have been multiplied by 2; if 8, by 4, &c.

A TABLE

Showing the quantity of Weft on any given Breadth, from 40 to 72 Inches, and from one Lash to millions of Lashes; by whole and decimal numbers, decreasing or increasing by a ten-fold proportion—with 5 per cent. allowance on the Linen Standard, equal to 10 per cent. on the Cotton, providing it is full tale.

Inches broad.	1000ths. *Lashes.*	900ths. *Lashes.*	800ths. *Lashes.*	700ths. *Lashes.*	600ths. *Lashes.*
40	162.000	145.800	129.600	113.400	97.200
41	166.050	149.445	132.840	116.235	99.630
42	170.100	153.090	136.080	119.070	102.060
43	174.150	156.735	139.320	121.905	104.490
44	178.200	160.380	142.560	124.740	106.920
45	182.250	164.025	145.800	127.575	109.350
46	186.300	167.670	149.040	130.410	111.780
47	190.350	171.315	152.280	133.245	114.210
48	194.400	174.960	155.520	136.080	116.640
49	198.450	178.605	158.760	138.915	119.070
50	202.500	182.250	162.000	141.750	121.500
51	206.550	185.895	165.240	144.585	123.930
52	210.600	189.540	168.480	147.420	126.360
53	214.650	193.185	171.720	150.255	128.790
54	218.700	196.830	174.960	153.090	131.220
55	222.750	200.475	178.200	155.925	133.650
56	226.800	204.120	181.440	158.760	136.080
57	230.850	207.765	184.680	161.595	138.510
58	234.900	211.410	187.920	164.430	140.940
59	238.950	215.055	191.160	167.265	143.370
60	243.600	218.700	194.400	170.100	145.800
61	247.050	222.345	197.640	172.935	148.230
62	251.100	225.990	200.880	175.770	150.660
63	255.150	229.635	204.120	178.605	153.090
64	259.200	233.280	207.360	181.440	155.520
65	263.250	236.925	210.600	184.275	157.950
66	267.300	240.570	213.840	187.110	160.380
67	271.350	244.215	217.080	189.945	162.810
68	275.400	247.860	220.320	192.780	165.240
69	279.450	251.505	223.560	195.615	167.670
70	283.500	255.150	226.800	198.450	170.100
71	287.550	258.795	230.040	201.285	172.530
72	291.600	262.440	233.280	204.120	174.960

A TABLE

Showing the quantity of Weft on any given Breadth, from 40 *to* 72 *Inches, and from one Lash to millions of Lashes; by whole and decimal numbers, decreasing or increasing by a ten-fold proportion—with* 5 *per cent. allowance on the Linen Standard, equal to ten per cent. on the Cotton, providing it is full tale.*

Inches broad.	500ths. *Lashes.*	400ths. *Lashes.*	300ths. *Lashes.*	200ths. *Lashes.*	100ths. *Lashes.*
40	81.000	64.800	48.600	32.400	16.200
41	83.025	66.420	49.815	33.210	16.605
42	85.050	68.040	51.030	34.020	17.010
43	87.075	69.660	52.245	34.830	17.415
44	89.100	71.280	53.460	35.640	17.820
45	91.125	72.900	54.675	36.450	18.225
46	93.150	74.520	55.890	37.260	18.630
47	95.175	76.140	57.105	38.070	19.035
48	97.200	77.760	58.320	38.880	19.440
49	99.225	79.380	59.535	39.690	19.845
50	101.250	81.000	60.750	40.500	20.250
51	103.275	82.620	61.965	41.310	20.655
52	105.300	84.240	63.180	42.120	21.060
53	107.325	85.860	64.395	42.930	21.465
54	109.350	87.480	65.610	43.740	21.870
55	111.375	89.100	66.825	44.550	22.275
56	113.400	90.720	68.040	45.360	22.680
57	115.425	92.340	69.255	46.170	23.085
58	117.450	93.960	70.470	46.980	23.490
59	119.475	95.580	71 685	47.790	23.895
60	121.500	97.200	72.900	48.600	24.300
61	123.525	98.820	74.115	49.410	24.705
62	125.550	100.440	75.330	50.220	25.110
63	127.575	102.060	76.545	51.030	25.515
64	129.600	103.680	77.760	51.840	25.920
65	131.625	105.300	78.975	52.650	26.325
66	133.650	106.920	80.190	53.460	26.730
67	135.675	108.540	81.405	54.270	27.135
68	137.700	110.160	82.620	55.080	27.540
69	139.725	111.780	83.835	55.890	27.945
70	141.750	113.400	85.050	56.700	28.350
71	143.775	115.020	86.265	57.510	28.755
72	145.800	116.640	87.480	58.320	29.160

	Quantity of Cloth at the rates of			
No. of Lashes.	50 *Lashes* ⅌ *Inch.*		60 *Lashes* ⅌ *Inch.*	
	Ells.	In.	Ells.	In.
100	0	2	0	1⅔
200	0	4	0	3⅓
300	0	6	0	5
400	0	8	0	6⅔
500	0	10	0	8⅓
600	0	12	0	10
700	0	14	0	11⅔
800	0	16	0	13⅓
900	0	18	0	15
1000	0	20	0	16⅔
2000	0	40	0	33⅓
3000	1	15	1	5
4000	1	35	1	21⅔
5000	2	10	1	38⅓
6000	2	30	2	10
7000	3	5	2	26⅔
8000	3	25	2	43⅓
9000	4	0	3	15
10000	4	20	3	31⅔
20000	8	40	7	18⅓
30000	13	15	11	5
40000	17	35	14	36⅔
50000	22	10	18	23⅓
60000	26	30	22	10
70000	31	5	25	41⅔
80000	35	25	29	28⅓
90000	40	0	33	15
100000	44	20	37	1⅔
200000	88	40	74	3⅓
300000	133	15	111	5
400000	177	35	148	6⅔
500000	222	10	185	8⅓
600000	266	30	222	10
700000	311	5	259	11⅔
800000	355	25	296	13⅓
900000	400	2	333	15
1000000	444	20	370	16⅔

This table shows the quantity of cloth produced by any number of lashes, at the rates of 50 and 60 lashes per inch.

For example, 126800 lashes, with 50 lashes, or 100 shots to an inch, will produce as under:—

		ells.	inches.
100000	=	44	20
20000	=	8	40
6000	=	2	30
800	=	0	16
		56	16

WARPING.

When the quantity of warp in any web is ascertained, it is given to the warper, with a ticket expressing the number of ells, spyndles, and porters in the web. If the web be stripped, either with different grists, or colours of yarn, one sett of the pattern must likewise be drawn on the ticket, for the warper and weaver's instruction. In the 2d example of the calculation of webs from cotton yarn, it was found, that 30 spyndles, and about 12 Nos. were requisite for a web in which were 100 ells, and 92 porters, 12 splits. But, as this calculation was made to the full extent of the cotton standard, the usual allowance of 1 spyndle to 20 must be made for waste, which in the present instance, may be taken at 1 spyndle and 12 Nos. This added to 30 spyndles 12 Nos. gives 32½ spyndles for the nett warp of the web. If six numbers of the yarn be wound on the bobbin, as is generally the case, the number of bobbins, or runners, in this example will be 97. When these are placed in the bank, and the ends taken through the heck, they are all knotted together and placed on the upper pin of the mill. The lease is then formed by raising alternately the two parts or frames of the heck, and secured on the upper lease pins; after which, the yarn is divided into small parcels, called half gangs or half bouts, which are kept separate by the rollers on the frame of the heck, during the process of warping. The number of threads in the half gang are usually regulated by the sett of the reed, though this is often left to the warper's discretion. The mill is then turned round, and as the cord by which the heck is suspended unwinds itself from the upper spindle of the mill, the heck gradually descends, and warps the yarn round the mill in a spiral direction, until the length of the web be determined. In the present example, if the mill were five ells round, 20 rounds or turns of the mill would give the length; but if the mill were only four ells, 25 rounds would be requisite. The under lease fork is then placed a little beyond the 100 ells, to make an allowance for the thrum and neck; and the half gangs are turned round the pins of the fork, and crossed alternately in manner of a lease. The mill is then turned the contrary way, until the heck be again opposite the upper fork, when a lease is made by the heck, and placed in the fork pins as before. Once down the mill and up again is called a *bout*, or *mill-gang;* and as there are now two threads on the mill for each runner, the number of splits in one bout will always be equal to the number of runners.

Before the warper proceeds further, he must calculate how many bouts are necessary to produce the whole warp of the web. This is done by reducing the porters in the web to splits, and dividing by the number of runners, and the quotient will give the answer—thus,

porters. splits.
92 12
20
———
97)1852(19 bouts.
97
———
882
873
———
9 splits over.

That is, 19 bouts and 9 splits over; which 9 splits must be made up either by running another bout with 9 bobbins, or adding another bobbin for the last 9 bouts.

When the warp consists of different grists or colours of yarn, as in stripes, ginghams, pullicates, &c. the bobbins must be arranged in the bank agreeably to the order in which the draught is marked on the ticket. For instance, in the 5th example of the calculation of webs from cotton yarn, there is one half of the fine space, viz. 21 splits, marked on each side of the stripe, in the pattern, for one side of which 42 bobbins fine must be placed in the bank. And as the first stripe contains five splits coarse, supposing four threads to the split, 20 bobbins must next be placed in the bank. Then follow 12 bobbins fine for the six splits in the intervening space; but as no ordinary heck will admit the whole of the pattern at one time, one half of it must be taken, which will require other 20 bobbins coarse for the half of the centre stripe.

The number of runners therefore will be 94; and one bout, or once down and up the mill will complete one set of the pattern. The selvages are warped independent of the draught, either by themselves, or by adding the requisite number of bobbins to the first and last bouts.

As the circumference of the five ell mill is now commonly divided by the spokes, into 20 equal parts, and the four ell mill into 16, each of these parts will be equal to ¼th of the English ell of 45 inches. At whatever distance, therefore, the keels, or cutting marks are to be placed, the ells and parts of an ell between them, may be counted round the mill, and marked accordingly. But if the web is to be divided into pieces of any particular lengths, as for squares, &c. a nitting divided into inches, and applied round the mill, along the chain, will give any length required.

When the whole of the warp is on the mill, the leases are secured by tying a piece of twine round the upper parts of the warp, which are separated by the pins, and the web is taken off the mill, either by rolling it up in form of a clue, or making it into a chain, by taking it over each hand alternately, in loops.

When the web is finished, the warper marks the number of pins on the ticket for the beamer's instruction, which is found by doubling the number of pins in the race, and multiplying them by the number of gangs.

In large factories where the warper is not restricted to any number of bobbins, it is customary to allow one runner for each porter in the web, which will always give 20 bouts.

In warping stripes or ginghams, when the stripes are not similar on each side, the pattern must be *couped;* that is, when the lease is taken the second time, both at head and foot, that part of the warp that would be outward in the usual way, must be turned toward the mill at each bout.

BEAMING.

To find the number of the ravel, or evener, which will spread out the warp of a web to the given breadth on the beam—ravels, like reeds, are counted by the number of teeth, or pins, in 37 inches, between each of which a half gang is placed in beaming.

When, therefore, the web is any other breadth than ell, the number of half gangs multiplied by 16, and divided by the nails in the breadth, will give the number of the ravel sought.

In the preceding example of warping, suppose 308 half gangs, then as the web is $\frac{6}{4}$

$$\begin{array}{r}
308 \\
16 \\
\hline
1848 \\
308 \\
\hline
24)4928(205 \\
48 \\
\hline
128 \\
120 \\
\hline
8
\end{array}
\qquad\qquad
\text{Or thus, }\begin{array}{r}
308 \\
2 \\
\hline
3)616 \\
\hline
205 = \frac{1}{3}
\end{array}$$

That is 205 pins, or a *ten score or 5 ravel.* But, as the web is always laid a little broader on the beam than it is in the reed, the ravel must be somewhat coarser, or consist of fewer pins; and the *headings* are sloped gradually by holding the ravel less or more oblique.

COTTON YARN TABLES,

BOTH BY DISCOUNT, AND AT A PRICE PER LIB.

Cotton yarn lists have, from time to time, been calculated to a great extent; but owing to the progressive changes which have taken place in the state of trade, the greater part of them have now become obsolete. The following Tables have therefore been stript of all the encumbrances resulting from these changes, and adapted to the present state of the Cotton Manufacture: at the same time, embracing a range fully adequate to meet all the fluctuations that, under existing circumstances, are likely to take place in the Cotton Market. In the table by discounts, all below 50 per cent. is thrown off as useless, and the discounts on this New List, advance by 2½ to 65 per cent. To prevent, however, any confusion arising from this new arrangement, the corresponding old rates of discount are added at the bottom of the pages; so that either of these methods can be adopted at pleasure.

The finer yarns are sold at a variable price per lib. for No. 120; and the rate of this variation is, in the general trade, 3d. per lib.; the rise and fall from that No. being for the most part arbitrary. In the extensive speculations in the year 1825, cotton yarn was sold as high as 7/3 per lib. for No. 120, and since that time, in the most depressed state of the market, it has been sold below 4/. These prices, therefore, would seem to present limits to the fluctuations of the market; but it was considered that a Table, calculated from 3/. to 8/. per lib. would be fully sufficient to meet all the contingencies of the trade. The scales by which the prices rise and fall from No. 120, as already observed, are also variable, as many of the Spinners make out lists for themselves; but on comparing the lists of the principal Cotton Yarn Merchants in Scotland and England, this difference will be found not so great as to prove any objection to a general standard. This will appear from the two specimens subjoined to these Tables, of the lists of two principal Spinners, one in Glasgow, and the other in Manchester, and bearing the same date, viz. May 1st, 1824, a year in which trade may have been considered in a settled state. In Mr. Hussey's list, No 200 is 17/11, and in Ancoats', now Benjamin Gray's, Esq. the price of the same is 18/1, a difference of only 2d. on the lib. of this high No. or about $\frac{3}{16}$ths of a penny on the spyndle. It is from these data that the Table of Prices by the lib. for No. 120 has been calculated; and the whole have been carried to the 16ths of a penny per spyndle, which was considered necessary for the low prices at which yarns are now sold.

MULE TWIST, BY DISCOUNT.

No.	List Price.						New List.						2½ per cent.						5 per cent.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	*d.*	16	*s.*	*d.*	16	*s.*	*d.*	16	*s.*	*d.*	16	*s.*	*d.*	16	*s.*	*d.*	16	*s.*	*d.*	16	*s.*	*d.*	16
40	6	6	0	2	11	0	3	3	0	1	5	8	3	2	0	1	5	1	3	1	0	1	4	10
42	6	8	0	2	10	4	3	4	0	1	5	2	3	3	0	1	4	11	3	2	0	1	4	4
44	6	10	0	2	9	8	3	5	0	1	4	12	3	4	0	1	4	6	3	3	0	1	4	0
46	7	0	0	2	9	0	3	6	0	1	4	8	3	5	0	1	4	0	3	3	15	1	3	9
48	7	2	0	2	8	4	3	7	0	1	4	2	3	5	15	1	3	12	3	4	14	1	3	6
50	7	4	0	2	7	12	3	8	0	1	3	14	3	6	14	1	3	8	3	5	13	1	3	2
52	7	6	0	2	7	4	3	9	0	1	3	10	3	7	14	1	3	4	3	6	12	1	2	14
54	7	8	0	2	6	12	3	10	0	1	3	6	3	8	14	1	3	0	3	7	11	1	2	9
56	7	10	0	2	6	4	3	11	0	1	3	2	3	9	13	1	2	13	3	8	10	1	2	6
58	8	1	0	2	6	0	4	0	8	1	3	0	3	11	5	1	2	10	3	10	1	1	2	5
60	8	4	0	2	6	0	4	2	0	1	2	14	4	0	12	1	2	9	3	11	8	1	2	4
62	8	6	0	2	5	8	4	3	0	1	2	12	4	1	11	1	2	7	4	0	7	1	2	2
64	8	8	0	2	5	4	4	4	0	1	2	8	4	2	11	1	2	3	4	1	6	1	1	12
66	8	10	0	2	5	0	4	5	0	1	2	8	4	3	11	1	2	0	4	2	6	1	1	10
68	9	1	0	2	4	12	4	6	8	1	2	6	4	5	2	1	2	0	4	3	12	1	1	11
70	9	4	0	2	4	12	4	8	0	1	2	6	4	6	10	1	2	0	4	5	3	1	1	11
72	9	7	0	2	4	12	4	9	8	1	2	6	4	8	1	1	2	0	4	6	10	1	1	11
74	9	10	0	2	4	12	4	11	0	1	2	6	4	9	8	1	2	0	4	8	1	1	1	11
76	10	1	0	2	4	12	5	0	8	1	2	6	4	11	0	1	1	12	4	9	8	1	1	10
78	10	4	0	2	4	12	5	2	0	1	2	6	5	0	7	1	1	12	4	10	15	1	1	10
80	10	7	0	2	4	8	5	3	8	1	2	4	5	1	15	1	1	12	5	0	5	1	1	10
82	10	10	0	2	4	8	5	5	0	1	2	4	5	3	6	1	1	12	5	1	12	1	1	8
84	11	1	0	2	4	8	5	6	8	1	2	4	5	4	13	1	1	12	5	3	3	1	1	8
86	11	5	0	2	4	12	5	8	8	1	2	6	5	6	12	1	2	0	5	5	1	1	1	9
88	11	9	0	2	4	12	5	10	8	1	2	6	5	8	12	1	2	0	5	7	0	1	1	11
90	12	1	0	2	5	0	6	0	8	1	2	8	5	10	11	1	2	2	5	8	14	1	1	12
92	12	7	0	2	5	8	6	3	8	1	2	12	6	1	10	1	2	5	5	11	12	1	2	0
94	13	1	0	2	6	0	6	6	8	1	3	0	6	4	8	1	2	12	6	2	8	1	2	6
96	13	7	0	2	6	8	6	9	8	1	3	4	6	7	7	1	2	14	6	5	7	1	2	8
98	14	1	0	2	7	0	7	0	8	1	3	8	6	10	6	1	3	1	6	8	4	1	2	11
100	14	7	0	2	7	8	7	3	8	1	3	12	7	1	5	1	3	5	6	11	2	1	3	0
102	15	1	0	2	8	0	7	6	8	1	4	0	7	4	4	1	3	8	7	2	0	1	3	2
104	15	7	0	2	8	8	7	9	8	1	4	4	7	7	3	1	3	12	7	4	13	1	3	6
106	16	1	0	2	8	12	8	0	8	1	4	6	7	10	1	1	3	14	7	7	11	1	3	8
108	16	7	0	2	9	4	8	3	8	1	4	10	8	1	0	1	4	2	7	10	8	1	3	11
110	17	1	0	2	9	8	8	6	8	1	4	12	8	4	0	1	4	6	8	1	6	1	3	14
112	17	9	0	2	10	4	8	10	8	1	5	2	8	7	14	1	4	10	8	5	3	1	4	3
114	18	5	0	2	11	0	9	2	8	1	5	8	8	11	12	1	5	0	8	9	0	1	4	8
116	19	1	0	2	11	8	9	6	8	1	5	12	9	3	10	1	5	5	9	0	12	1	4	14
118	19	9	0	3	9	4	9	10	8	1	6	2	9	7	8	1	5	8	9	4	8	1	5	2
120	20	5	0	3	0	12	10	2	8	1	6	6	9	11	7	1	6	0	9	8	6	1	5	8
							50 per cent.						51¼ per cent.						52½ per cent.					

MULE TWIST, BY DISCOUNT.

No.	7½ per cent.						10 per cent.						12½ per cent.						15 per cent.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16
40	3	0	1	1	4	4	2	11	2	1	3	12	2	10	2	1	3	5	2	9	2	1	2	14
42	3	1	0	1	3	13	3	0	0	1	3	5	2	11	0	1	2	14	2	10	0	1	2	7
44	3	1	15	1	3	9	3	0	14	1	3	3	2	11	14	1	2	12	2	10	14	1	2	4
46	3	2	14	1	3	3	3	1	13	1	2	13	3	0	12	1	2	6	2	11	11	1	2	0
48	3	3	12	1	2	13	3	2	11	1	2	7	3	1	10	1	2	1	3	0	8	1	1	11
50	3	4	11	1	2	10	3	3	10	1	2	4	3	2	8	1	1	14	3	1	6	1	2	8
52	3	5	10	1	2	8	3	4	8	1	2	2	3	3	6	1	1	12	3	2	4	1	1	6
54	3	6	8	1	2	3	3	5	6	1	1	10	3	4	3	1	1	6	3	3	1	1	1	0
56	3	7	8	1	2	1	3	6	5	1	1	8	3	5	2	1	1	3	3	4	0	1	0	13
58	3	8	14	1	1	14	3	7	10	1	1	8	3	6	7	1	1	3	3	5	4	1	0	12
60	3	10	4	1	1	14	3	9	0	1	1	8	3	7	12	1	1	2	3	6	8	1	0	12
62	3	11	3	1	1	11	3	9	14	1	1	6	3	8	10	1	1	1	3	7	5	1	0	8
64	4	0	1	1	1	7	3	10	13	1	1	2	3	9	8	1	0	12	3	8	3	1	0	6
66	4	1	0	1	1	6	3	11	11	1	0	15	3	10	6	1	0	10	3	9	0	1	0	4
68	4	2	7	1	1	5	4	1	1	1	0	14	3	11	11	1	0	10	3	10	5	1	0	4
70	4	3	13	1	1	5	4	2	6	1	1	0	4	1	0	1	0	10	3	11	10	1	0	4
72	4	5	3	1	1	5	4	3	12	1	1	0	4	2	5	1	0	8	4	0	14	1	0	4
74	4	6	9	1	1	5	4	5	2	1	1	0	4	3	10	1	0	8	4	2	3	1	0	4
76	4	8	0	1	1	5	4	6	7	1	1	0	4	4	15	1	0	8	4	3	7	1	0	4
78	4	9	6	1	1	5	4	7	13	1	1	0	4	6	4	1	0	8	4	4	11	1	0	4
80	4	10	12	1	1	5	4	9	2	1	0	14	4	7	8	1	0	8	4	6	0	1	0	2
82	5	0	2	1	1	5	4	10	8	1	0	14	4	8	14	1	0	8	4	7	4	1	0	2
84	5	1	8	1	1	5	4	11	14	1	0	14	4	10	3	1	0	8	4	8	8	1	0	2
86	5	3	6	1	1	5	5	1	10	1	0	14	5	0	0	1	0	8	4	10	3	1	0	2
88	5	5	3	1	1	5	5	3	7	1	1	0	5	1	11	1	0	9	5	0	0	1	0	4
90	5	7	1	1	1	7	5	5	4	1	1	1	5	3	7	1	0	11	5	1	10	1	0	5
92	5	9	13	1	1	10	5	8	0	1	1	4	5	6	1	1	1	0	5	4	3	1	0	8
94	6	0	10	1	2	0	5	10	11	1	1	10	5	8	11	1	1	4	5	6	12	1	0	14
96	6	3	6	1	2	1	6	1	6	1	1	12	5	11	5	1	1	5	5	9	4	1	1	0
98	6	6	3	1	2	5	6	4	1	1	2	0	6	2	0	1	1	8	5	11	13	1	1	2
100	6	9	0	1	2	8	6	6	12	1	2	3	6	4	8	1	1	12	6	2	6	1	1	6
102	6	11	11	1	2	12	6	9	7	1	2	5	6	7	3	1	2	1	6	4	15	1	1	8
104	7	2	8	1	3	0	7	0	2	1	2	8	6	9	13	1	2	3	6	7	8	1	1	12
106	7	5	4	1	3	2	7	2	14	1	2	11	7	0	7	1	2	4	6	10	0	1	1	14
108	7	8	1	1	3	6	7	5	12	1	3	0	7	3	2	1	2	8	7	0	10	1	2	0
110	7	10	13	1	3	8	7	8	4	1	3	1	7	5	11	1	2	10	7	3	2	1	2	3
112	8	2	8	1	3	12	7	11	14	1	3	6	7	9	3	1	3	0	7	6	8	1	2	8
114	8	6	3	1	4	2	8	3	8	1	3	12	8	0	12	1	3	4	7	10	0	1	2	13
116	8	10	0	1	4	7	8	7	1	1	4	0	8	4	3	1	3	10	8	1	5	1	3	1
118	9	1	10	1	4	10	8	10	11	1	4	4	8	7	12	1	3	12	8	4	12	1	3	5
120	9	5	5	1	5	0	9	2	4	1	4	8	8	11	3	1	4	1	8	8	2	1	3	10
	53¾ per cent.						55 per cent.						56¼ per cent						57½ per cent.					

MULE TWIST, BY DISCOUNT.

No.	17½ per cent.						20 per cent.						22½ per cent.						25 per cent.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16
40	2	8	3	1	2	7	2	7	3	1	2	0	2	6	3	1	1	10	2	5	4	1	1	3
42	2	9	0	1	2	0	2	8	0	1	1	11	2	7	0	1	1	4	2	6	0	1	0	14
44	2	9	13	1	1	13	2	8	13	1	1	6	3	7	12	1	1	0	2	6	12	1	0	9
46	2	10	10	1	1	9	2	9	10	1	1	2	2	8	9	1	0	12	2	7	8	1	0	5
48	2	11	8	1	1	5	2	10	6	1	0	14	2	9	5	1	0	8	2	8	4	1	0	1
50	3	0	5	1	2	2	2	11	3	1	0	11	2	10	2	1	0	4	2	9	0	0	11	14
52	3	1	2	1	0	13	3	0	0	1	0	8	2	10	14	1	0	1	2	9	12	0	11	11
54	3	1	15	1	0	10	3	0	13	1	0	4	2	11	0	0	11	14	2	10	8	0	11	8
56	3	2	12	1	0	7	3	1	10	1	0	1	3	0	7	0	11	11	2	11	4	0	11	5
58	3	4	0	1	0	7	3	2	13	1	0	0	3	1	9	0	11	10	3	0	6	0	11	4
60	3	5	4	1	0	6	3	4	0	1	0	0	3	2	12	0	11	10	3	1	8	0	11	4
62	3	6	1	1	0	3	3	4	13	0	11	13	3	3	8	0	11	8	3	2	4	0	11	1
64	3	6	14	1	0	0	3	5	10	0	11	11	3	4	5	0	11	5	3	3	0	0	11	0
66	3	7	11	0	11	14	3	6	6	0	11	9	3	5	1	0	11	3	3	3	12	0	10	13
68	3	9	0	0	11	14	3	7	8	0	11	8	3	6	4	0	11	2	3	4	12	0	10	12
70	3	10	3	0	11	12	3	8	13	0	11	8	3	7	6	0	11	2	3	6	0	0	10	12
72	3	11	7	0	11	12	3	10	0	0	11	8	3	8	9	0	11	2	3	7	2	0	10	12
74	4	0	11	0	11	12	3	11	3	0	11	8	3	9	12	0	11	2	3	8	4	0	10	12
76	4	1	15	0	11	12	4	0	6	0	11	8	3	10	12	0	11	2	3	9	6	0	10	12
78	4	3	2	0	11	12	4	1	10	0	11	8	4	0	1	0	11	2	3	10	8	0	10	12
80	4	4	6	0	11	12	4	2	3	0	11	8	4	1	3	0	11	2	3	11	10	0	10	12
82	4	5	10	0	11	12	4	4	0	0	11	7	4	2	6	0	11	2	4	0	12	0	10	11
84	4	6	14	0	11	12	4	5	3	0	11	7	4	3	8	0	11	1	4	1	14	0	10	11
86	4	8	8	0	11	12	4	6	13	0	11	7	4	5	1	0	11	1	4	3	6	0	10	11
88	4	10	3	0	11	14	4	8	6	0	11	8	4	6	10	0	11	2	4	4	14	0	10	12
90	4	11	13	1	0	0	4	10	0	0	11	10	4	8	3	0	11	4	4	6	6	0	10	14
92	5	2	4	1	0	2	5	0	6	0	11	13	4	10	8	0	11	7	4	8	10	0	11	1
94	5	4	12	1	0	8	5	2	13	1	0	0	5	0	13	0	11	10	4	10	14	0	11	4
96	5	7	4	1	0	8	5	5	3	1	0	4	5	3	2	0	11	13	5	1	2	0	11	8
98	5	9	11	1	0	12	5	7	9	1	0	7	5	5	8	1	0	0	5	3	6	0	11	10
100	6	0	3	1	1	0	5	10	0	1	0	9	5	7	13	1	0	3	5	5	10	0	11	13
102	6	2	10	1	1	2	6	0	6	1	0	12	5	10	2	1	0	6	5	7	14	1	0	0
104	6	5	2	1	1	5	6	2	13	1	0	15	6	0	7	1	0	9	5	10	2	1	0	2
106	6	7	10	1	1	7	6	5	3	1	1	1	6	2	13	1	0	11	6	0	6	1	0	4
108	6	10	2	1	1	10	6	7	10	1	1	4	9	5	2	1	0	14	6	2	10	1	0	7
110	7	0	8	1	1	12	6	10	0	1	1	7	6	7	7	1	1	0	6	4	14	1	0	9
112	7	3	14	1	2	1	7	1	3	1	1	11	6	10	8	1	1	4	6	7	14	1	0	13
114	7	7	3	1	2	6	7	4	6	1	1	15	7	1	10	1	1	8	6	10	14	1	1	1
116	7	10	8	1	2	10	7	7	9	1	2	3	7	4	12	1	1	12	7	1	14	1	1	5
118	8	1	12	1	2	14	7	10	13	1	2	8	7	7	14	1	2	0	7	4	14	1	1	9
120	8	5	1	1	3	3	8	2	0	1	2	11	7	10	15	1	2	4	7	7	14	1	1	12
	58¾ per cent.						60 per cent.						61¼ per cent.						62½ per cent.					

MULE TWIST, BY DISCOUNT.

No.	27½ per cent.						30 per cent.						32½ per cent.						35 per cent.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16
40	2	4	4	1	0	12	2	3	5	1	0	4	2	2	5	0	11	13	2	1	6	0	11	6
42	2	5	0	1	0	7	2	4	0	1	0	0	2	3	0	0	11	9	2	2	0	0	11	2
44	2	5	12	1	0	3	2	4	11	0	11	12	2	3	11	0	11	5	2	2	10	0	10	14
46	2	6	7	0	11	15	2	5	6	0	11	8	2	4	6	0	11	1	2	3	5	0	10	11
48	2	7	3	0	11	11	2	6	1	0	11	4	2	5	0	0	10	14	2	4	0	0	10	8
50	2	7	15	0	11	8	2	6	13	0	11	1	2	5	11	0	10	11	2	4	10	0	10	5
52	2	8	10	0	11	5	2	7	8	0	10	15	2	6	6	0	10	8	2	5	4	0	10	2
54	2	9	5	0	11	1	2	8	3	0	10	12	2	7	1	0	10	6	2	5	15	0	10	0
56	2	10	1	0	11	0	2	8	14	0	10	9	2	7	11	0	10	3	2	6	9	0	9	15
58	2	11	2	0	10	14	2	10	0	0	10	8	2	8	12	0	10	2	2	7	8	0	9	12
60	3	0	4	0	10	13	2	11	0	0	10	8	2	9	12	0	10	2	2	8	8	0	9	12
62	3	1	0	0	10	11	2	11	11	0	10	6	2	10	7	0	10	0	2	9	2	0	9	10
64	3	1	11	0	10	9	3	0	6	0	10	4	2	11	2	0	9	14	2	9	13	0	9	8
66	3	2	7	0	10	8	3	1	2	0	10	2	2	11	12	0	9	12	2	10	7	0	9	6
68	3	3	6	0	10	7	3	2	0	0	10	1	3	0	11	0	9	11	2	11	5	0	9	6
70	3	4	10	0	10	7	3	3	3	0	10	1	3	1	13	0	9	11	3	0	6	0	9	6
72	3	5	11	0	10	7	3	4	4	0	10	1	3	2	13	0	9	11	3	1	6	0	9	5
74	3	6	12	0	10	6	3	5	5	0	10	1	3	3	13	0	9	11	3	2	6	0	9	4
76	3	7	14	0	10	6	3	6	6	0	10	0	3	4	13	0	9	11	3	3	5	0	9	4
78	3	9	0	0	10	6	3	7	6	0	10	0	3	5	14	0	9	11	3	4	5	0	9	4
80	3	10	0	0	10	6	3	8	7	0	10	0	3	6	14	0	9	11	3	5	4	0	9	4
82	3	11	2	0	10	6	3	9	8	0	10	0	3	7	14	0	9	10	3	6	4	0	9	4
84	4	0	3	0	10	5	3	10	8	0	10	0	3	8	14	0	9	10	3	7	3	0	9	4
86	4	1	11	0	10	5	4	0	0	0	10	0	3	10	4	0	9	10	3	8	8	0	9	4
88	4	3	2	0	10	6	4	1	6	0	10	0	3	11	9	0	9	11	3	9	13	0	9	5
90	4	4	9	0	10	8	4	2	12	0	10	2	4	0	15	0	9	13	3	11	2	0	9	7
92	4	6	12	0	10	11	4	4	14	0	10	5	4	3	0	0	10	0	4	1	1	0	9	10
94	4	8	4	0	10	14	4	6	15	0	10	8	4	5	0	0	10	2	4	3	0	0	9	12
96	4	11	1	0	11	1	4	9	1	0	10	11	4	7	0	0	10	5	4	5	0	0	9	15
98	5	1	4	0	11	4	4	11	2	0	10	14	4	9	0	0	10	8	4	6	15	0	10	1
100	5	3	7	0	11	7	5	1	4	0	11	0	4	11	1	0	10	10	4	8	14	0	10	4
102	5	5	10	0	11	9	5	3	6	0	11	3	5	1	1	0	10	12	4	10	13	0	10	6
104	5	7	12	0	11	12	5	5	7	0	11	5	5	3	2	0	10	15	5	0	12	0	10	8
106	5	10	0	0	11	14	5	7	9	0	11	8	5	5	2	0	11	1	5	2	12	0	10	10
108	6	0	2	1	0	0	5	9	10	0	11	10	5	7	2	0	11	3	5	4	10	0	10	12
110	6	2	5	1	0	3	5	11	12	0	11	12	5	9	3	0	11	5	5	6	10	0	10	14
112	6	5	3	1	0	6	6	2	9	1	0	0	5	11	14	0	11	9	5	9	3	0	11	2
114	6	8	2	1	0	10	6	5	6	1	0	3	6	2	9	0	11	12	5	11	14	0	11	5
116	6	11	0	1	1	14	6	8	2	1	0	7	6	5	4	1	0	0	6	2	7	0	11	9
118	7	1	15	1	1	2	6	10	15	1	0	10	6	8	0	1	0	3	6	5	0	0	11	12
120	7	4	13	1	1	5	7	1	12	1	0	14	6	10	11	1	0	7	6	7	10	0	11	15
	63¾ per cent.						65 per cent.						66¼ per cent.						67½ per cent.					

MULE TWIST, BY DISCOUNT.

No.	37½ per cent.						40 per cent.						42½ per cent.						45 per cent.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16
40	2	0	6	0	11	0	1	11	6	0	10	8	1	10	7	0	10	1	1	9	7	0	9	11
42	2	1	0	0	10	11	2	0	0	0	10	4	1	11	0	0	9	14	1	10	0	0	9	7
44	2	1	10	0	10	8	2	0	10	0	10	1	1	11	9	0	9	10	1	10	9	0	9	4
46	2	2	4	0	10	4	2	1	3	0	9	14	2	0	2	0	9	8	1	11	1	0	9	0
48	2	2	14	0	10	1	2	1	13	0	9	11	2	0	12	0	9	4	1	11	10	0	8	14
50	2	3	8	0	9	15	2	2	7	0	9	8	2	1	5	0	9	2	2	0	3	0	8	12
52	2	4	2	0	9	12	2	3	0	0	9	5	2	1	14	0	9	0	2	0	12	0	8	9
54	2	4	12	0	9	9	2	3	9	0	9	3	2	2	7	0	8	13	2	1	5	0	8	7
56	2	5	6	0	9	7	2	4	3	0	9	1	2	3	0	0	8	11	2	1	14	0	8	5
58	2	6	5	0	9	6	2	5	2	0	9	0	2	3	14	0	8	10	2	2	11	0	8	4
60	2	7	4	0	9	6	2	6	0	0	9	0	2	4	12	0	8	10	2	3	8	0	8	4
62	2	7	14	0	9	4	2	6	10	0	8	14	2	5	5	0	8	8	2	4	0	0	8	2
64	2	8	8	0	9	2	2	7	3	0	8	12	2	5	14	0	8	6	2	4	10	0	8	0
66	2	9	2	0	9	0	2	7	13	0	8	11	2	6	7	0	8	5	2	5	2	0	7	15
68	2	9	15	0	9	0	2	8	9	0	8	10	2	7	3	0	8	4	2	5	14	0	7	14
70	2	11	0	0	9	0	2	9	10	0	8	10	2	8	3	0	8	4	2	6	13	0	7	14
72	2	11	15	0	9	0	2	10	8	0	8	10	2	9	2	0	8	4	2	7	12	0	7	14
74	3	0	14	0	8	14	2	11	6	0	8	8	2	9	15	0	8	2	2	8	7	0	7	14
76	3	1	13	0	8	15	3	0	5	0	8	9	2	10	12	0	8	4	2	9	4	0	7	14
78	3	2	12	0	8	15	3	1	3	0	8	9	2	11	10	0	8	4	2	10	2	0	7	14
80	3	3	11	0	8	15	3	2	2	0	8	9	3	0	8	0	8	4	2	10	15	0	7	14
82	3	4	10	0	8	15	3	3	0	0	8	9	3	1	6	0	8	3	2	11	12	0	7	13
84	3	5	9	0	8	14	3	3	14	0	8	9	3	2	3	0	8	3	3	0	9	0	7	13
86	3	6	13	0	8	14	3	5	1	0	8	8	3	3	6	0	8	3	3	1	11	0	7	14
88	3	8	1	0	8	15	3	6	5	0	8	9	3	4	9	0	8	4	3	2	12	0	7	15
90	3	9	5	0	9	1	3	7	8	0	8	11	3	5	11	0	8	5	3	3	14	0	8	0
92	3	11	3	0	9	4	3	9	5	0	8	14	3	7	6	0	8	8	3	5	8	0	8	2
94	4	1	1	0	9	6	3	11	1	0	9	0	3	9	2	0	8	10	3	7	3	0	8	4
96	4	3	0	0	9	9	4	0	15	0	9	3	3	10	14	0	8	12	3	8	13	0	8	6
98	4	4	13	0	9	11	4	2	11	0	9	5	4	0	9	0	8	15	3	10	8	0	8	8
100	4	6	11	0	9	13	4	4	8	0	9	8	4	2	5	0	9	1	4	0	2	0	8	11
102	4	8	9	0	10	0	4	6	5	0	9	9	4	4	0	0	9	3	4	1	12	0	8	12
104	4	10	7	0	10	2	4	8	2	0	9	11	4	5	12	0	9	5	4	3	7	0	8	14
106	5	0	5	0	10	4	4	9	14	0	9	13	4	7	12	0	9	6	4	5	1	0	9	0
108	5	2	3	0	10	6	4	11	11	0	10	0	4	9	3	0	9	8	4	6	12	0	9	2
110	5	4	1	0	10	8	5	1	8	0	10	1	4	10	15	0	9	10	4	8	6	0	9	4
112	5	6	9	0	10	11	5	3	14	0	10	4	4	11	1	0	9	13	4	10	9	0	9	7
114	5	9	1	0	10	14	5	6	5	0	10	8	5	3	8	0	10	0	5	0	12	0	9	9
116	5	11	9	0	11	2	5	8	11	0	10	11	5	5	14	0	10	3	5	3	0	0	9	12
118	6	2	1	0	11	5	5	11	2	0	10	13	5	8	2	0	10	6	5	5	3	0	9	15
190	6	4	9	0	11	8	6	1	8	0	11	0	5	10	7	0	10	9	5	7	6	0	10	2
	68¾ per cent.						70 per cent.						71¼ per cent.						72½ per cent.					

MULE TWIST, BY DISCOUNT.

No.	47½ per cent.						50 per cent.						52½ per cent.						55 per cent.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16
40	1	8	8	0	9	5	1	7	8	0	8	12	1	6	8	0	8	5	1	5	9	0	7	14
42	1	9	0	0	8	16	1	8	0	0	8	9	1	7	0	0	8	2	1	6	0	0	7	11
44	1	9	8	0	8	13	1	8	8	0	8	6	1	7	8	0	8	0	1	6	7	0	7	8
46	1	10	1	0	8	10	1	9	0	0	8	4	1	8	0	0	7	13	1	6	15	0	7	6
48	1	10	9	0	8	8	1	9	8	0	8	1	1	8	7	0	7	11	1	7	5	0	7	4
50	1	11	2	0	8	5	1	10	0	0	7	15	1	8	15	0	7	8	1	7	12	0	7	2
52	1	11	10	0	8	3	1	10	8	0	7	12	1	9	6	0	7	6	1	8	4	0	7	0
54	2	0	2	0	8	1	1	11	0	0	7	11	1	9	14	0	7	4	1	8	11	0	6	15
56	2	0	11	0	7	15	1	11	8	0	7	9	1	10	5	0	7	3	1	9	2	0	6	13
58	2	1	8	0	7	15	2	0	4	0	7	8	1	11	1	0	7	2	1	9	13	0	6	12
60	2	2	4	0	7	14	2	1	0	0	7	8	1	11	12	0	7	2	1	10	8	0	6	12
62	2	2	12	0	7	12	2	1	8	0	7	6	2	0	3	0	7	0	1	10	15	0	6	11
64	2	3	5	0	7	11	2	2	0	0	7	5	2	0	11	0	6	15	1	11	6	0	6	9
66	2	3	13	0	7	9	2	2	8	0	7	4	2	1	3	0	6	14	1	11	14	0	6	8
68	2	4	8	0	7	9	2	3	2	0	7	3	2	1	12	0	6	13	2	0	6	0	6	8
70	2	5	6	0	7	9	2	4	0	0	7	3	2	2	10	0	6	13	2	1	3	0	6	8
72	2	6	5	0	7	9	2	4	14	0	7	3	2	3	7	0	6	13	2	2	0	0	6	8
74	2	7	0	0	7	7	2	5	8	0	7	1	2	4	0	0	6	11	2	2	9	0	6	6
76	2	7	12	0	7	8	2	6	4	0	7	2	2	4	12	0	6	12	2	3	4	0	6	7
78	2	8	9	0	7	8	2	7	0	0	7	2	2	5	7	0	6	12	2	3	14	0	6	7
80	2	9	5	0	7	8	2	7	12	0	7	2	2	6	3	0	6	12	2	4	9	0	6	7
82	2	10	2	0	7	8	2	8	8	0	7	2	2	6	14	0	6	12	2	5	4	0	6	7
84	2	10	14	0	7	7	2	9	4	0	7	1	2	7	9	0	6	11	2	5	14	0	6	6
86	3	0	0	0	7	8	2	10	4	0	7	2	2	8	9	0	6	13	2	6	13	0	6	7
88	3	1	0	0	7	9	2	11	4	0	7	3	2	9	8	0	6	14	2	7	12	0	6	8
90	3	2	1	0	7	10	3	0	4	0	7	4	2	10	7	0	6	14	2	8	10	0	6	8
92	3	3	10	0	7	12	3	1	12	0	7	6	2	11	14	0	7	0	2	10	0	0	6	10
94	3	5	3	0	7	14	3	3	4	0	7	8	3	1	4	0	7	2	2	11	5	0	6	12
96	3	6	12	0	8	0	3	4	12	0	7	10	3	2	11	0	7	4	3	0	11	0	6	14
98	3	8	6	0	8	2	3	6	4	0	7	12	3	4	2	0	7	6	3	2	0	0	7	0
100	3	9	15	0	8	4	3	7	12	0	7	14	3	5	9	0	7	8	3	3	6	0	7	1
102	3	11	8	0	8	6	3	9	4	0	8	0	3	6	15	0	7	9	3	4	11	0	7	3
104	4	1	1	0	8	8	3	10	12	0	8	1	3	8	6	0	7	11	3	6	1	0	7	4
106	4	2	11	0	8	9	4	0	4	0	8	3	3	9	13	0	7	12	3	7	7	0	7	6
108	4	4	4	0	8	11	4	1	12	0	8	5	3	11	4	0	7	14	3	8	12	0	7	8
110	4	5	13	0	8	13	4	3	4	0	8	6	4	0	11	0	8	0	3	10	2	0	7	9
112	4	7	14	0	9	0	4	5	4	0	8	9	4	2	9	0	8	2	3	11	15	0	7	11
114	4	10	0	0	9	3	4	7	4	0	8	11	4	4	8	0	8	4	4	1	12	0	7	13
116	5	0	2	0	9	5	4	9	4	0	8	14	4	6	6	0	8	7	4	3	8	0	8	0
118	5	2	4	0	9	8	4	11	4	0	9	0	4	8	4	0	8	9	4	5	5	0	8	2
120	5	4	5	0	9	11	5	1	4	0	9	2	4	10	3	0	8	10	4	7	2	0	8	3
	73¾ per cent.						75 per cent.						76¼ per cent.						77½ per cent.					

MULE TWIST, BY DISCOUNT.

No.	57½ per cent.						60 per cent.						62½ per cent.						65 per cent.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16	s.	d.	16
40	1	4	9	0	7	7	1	3	9	0	7	0	1	2	10	0	6	9	1	1	10	0	6	2
42	1	5	0	0	7	4	1	4	0	0	6	14	1	3	0	0	6	7	1	2	0	0	6	0
44	1	5	7	0	7	2	1	4	6	0	6	11	1	3	6	0	6	4	1	2	6	0	5	14
46	1	5	14	0	7	0	1	4	13	0	6	9	1	3	12	0	6	3	1	2	11	0	5	12
48	1	6	4	0	6	14	1	5	3	0	6	7	1	4	2	0	6	1	1	3	1	0	5	10
50	1	6	11	0	6	12	1	5	10	0	6	6	1	4	8	0	5	5	1	3	6	0	5	7
52	1	7	2	0	6	10	1	6	0	0	6	4	1	4	14	0	5	13	1	3	12	0	5	6
54	1	7	9	0	6	8	1	6	6	0	6	2	1	5	4	0	5	12	1	4	2	0	5	6
56	1	8	0	0	6	7	1	6	13	0	6	1	1	5	10	0	5	11	1	4	7	0	5	4
58	1	8	10	0	6	6	1	7	6	0	6	0	1	6	3	0	5	10	1	5	0	0	5	4
60	1	9	4	0	6	6	1	8	0	0	6	0	1	6	12	0	5	10	1	5	8	0	5	4
62	1	9	11	0	6	5	1	8	6	0	5	15	1	7	2	0	5	9	1	5	14	0	5	3
64	1	10	2	0	6	3	1	8	13	0	5	13	1	7	8	0	5	8	1	6	3	0	5	2
66	1	10	8	0	6	2	1	9	3	0	5	12	1	7	14	0	5	7	1	6	9	0	5	1
68	1	11	0	0	6	1	1	9	11	0	5	12	1	8	5	0	5	6	1	7	1	0	5	0
70	1	11	13	0	6	1	1	10	6	0	5	12	1	9	0	0	5	6	1	7	10	0	5	0
72	2	0	7	0	6	1	1	11	1	0	5	12	1	9	11	0	5	6	1	8	2	0	5	0
74	2	1	1	0	6	0	1	11	10	0	5	10	1	10	2	0	5	6	1	8	10	0	5	0
76	2	1	12	0	6	1	2	0	3	0	5	11	1	10	11	0	5	6	1	9	3	0	5	0
78	2	2	6	0	6	1	2	0	15	0	5	11	1	11	4	0	5	6	1	9	11	0	5	0
80	2	3	0	0	6	1	2	1	6	0	5	11	1	11	13	0	5	6	1	10	3	0	5	0
82	2	3	10	0	6	1	2	2	0	0	5	11	2	0	6	0	5	6	1	10	12	0	5	0
84	2	4	4	0	6	0	2	2	9	0	5	10	2	0	15	0	5	5	1	11	4	0	4	15
86	2	5	2	0	6	1	2	3	7	0	5	11	2	1	11	0	5	6	2	0	0	0	5	0
88	2	6	0	0	6	2	2	4	3	0	5	12	2	2	7	0	5	7	3	0	11	0	5	1
90	2	6	13	0	6	2	2	5	0	0	5	13	2	3	3	0	5	7	2	1	6	0	5	1
92	2	8	1	0	6	4	2	6	3	0	5	15	2	4	5	0	5	9	2	2	7	0	5	3
94	2	9	6	0	6	6	2	7	6	0	6	0	2	5	7	0	5	10	2	3	8	0	5	4
96	2	10	10	0	6	8	2	8	9	0	6	2	2	6	9	0	5	11	2	4	8	0	5	5
98	2	11	15	0	6	9	2	9	13	0	6	3	2	7	11	0	5	13	2	5	9	0	5	7
100	3	1	3	0	6	11	2	11	0	0	6	5	2	8	13	0	5	15	2	6	10	0	5	8
102	3	2	7	0	6	12	3	0	3	0	6	6	2	9	14	0	6	0	2	7	11	0	5	9
104	3	3	12	0	6	14	3	1	6	0	6	8	2	11	1	0	6	1	2	8	12	0	5	10
106	3	5	0	0	6	15	3	2	10	0	6	9	3	0	3	0	6	2	2	9	12	0	5	11
108	3	6	4	0	7	1	3	3	13	0	6	10	3	1	5	0	6	4	2	10	13	0	5	13
110	3	7	9	0	7	2	3	5	0	0	6	11	3	2	7	0	6	5	2	11	14	0	5	14
112	3	9	4	0	7	4	3	6	9	0	6	13	3	3	15	0	6	7	3	1	4	0	6	0
114	3	10	15	0	7	7	3	8	3	0	7	0	3	5	7	0	6	8	3	2	11	0	6	2
116	4	0	11	0	7	9	3	9	14	0	7	2	3	6	15	0	6	11	3	4	1	0	6	3
118	4	2	6	0	7	11	3	11	7	0	7	3	3	8	7	0	6	12	3	5	8	0	6	5
120	4	4	1	0	7	12	4	1	0	0	7	4	3	10	0	0	6	13	3	6	14	0	6	6
	78¾ per cent.						80 per cent.						81¼ per cent.						82½ per cent.					

YARN SOLD AT A PRICE FOR NO. 18.

No.	At 1s.						At 1s. 0½d.						At 1s. 1d.						At 1s. 1½d.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	*d.*	*f*	*s.*	*d.*	16	*s.*	*d.*	*f.*	*s.*	*d.*	16	*s.*	*d.*	*f.*	*s.*	*d.*	16	*s.*	*d.*	*f.*	*s.*	*d.*	16
18	1	0	0	1	0	0	1	0	2	1	0	8	1	1	0	1	1	0	1	1	2	1	1	8
20	1	1	0	0	11	11	1	1	2	1	0	2	1	2	0	1	0	9	1	2	2	1	1	1
22	1	1	2	0	11	1	1	2	0	0	11	7	1	2	2	0	11	14	1	3	0	1	0	4
24	1	2	0	0	10	8	1	2	2	0	10	14	1	3	0	0	11	4	1	3	2	0	11	10
26	1	2	2	0	10	0	1	3	0	0	10	6	1	3	2	0	10	12	1	4	0	0	11	1
28	1	3	0	0	9	10	1	3	2	0	9	15	1	4	0	0	10	4	1	4	2	0	10	9
	At 1s. 2d.						At 1s. 2½d.						At 1s. 3d.						At 1s. 3½d.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	*d.*	*f.*	*s.*	*d.*	16	*s.*	*d.*	*f.*	*s.*	*d.*	16	*s.*	*d.*	*f.*	*s.*	*d.*	16	*s.*	*d.*	*f.*	*s.*	*d.*	16
18	1	2	0	1	2	0	1	2	2	1	2	8	1	3	0	1	3	0	1	3	2	1	3	8
20	1	3	0	1	1	8	1	3	2	1	1	15	1	4	0	1	2	6	1	4	2	1	2	14
22	1	3	2	1	0	10	1	4	0	1	1	1	1	4	2	1	1	8	1	5	0	1	1	14
24	1	4	0	1	0	0	1	4	2	1	0	6	1	5	0	1	0	12	1	5	2	1	1	2
26	1	4	2	0	11	6	1	5	0	0	11	12	1	5	2	1	0	2	1	6	0	1	0	7
28	1	5	0	0	10	15	1	5	2	0	11	4	1	6	0	0	11	9	1	6	2	0	11	14
	At 1s. 4d.						At 1s. 4½d.						At 1s. 5d.						At 1s. 5½d.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	*d.*	*f.*	*s.*	*d.*	16	*s.*	*d.*	*f.*	*s.*	*d.*	16	*s.*	*d*	*f.*	*s.*	*d.*	16	*s.*	*d.*	*f.*	*s.*	*d.*	16
18	1	4	0	1	4	0	1	4	2	1	4	8	1	5	0	1	5	0	1	5	2	1	5	8
20	1	5	0	1	3	5	1	5	2	1	3	12	1	6	0	1	4	3	1	6	2	1	4	10
22	1	5	2	1	2	5	1	6	0	1	2	11	1	6	2	1	3	2	1	7	0	1	3	9
24	1	6	0	1	1	8	1	6	2	1	1	14	1	7	0	1	2	4	1	7	2	1	2	10
26	1	6	2	1	0	13	1	7	0	1	0	2	1	7	2	1	1	8	1	8	0	1	1	13
28	1	7	0	1	0	3	1	7	2	1	0	8	1	8	0	1	0	14	1	8	2	1	1	3
	At 1s. 6d.						At 1s. 6½d.						At 1s. 7d.						At 1s. 7½d.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	*d.*	*f.*	*s.*	*d.*	16	*s.*	*d.*	*f.*	*s.*	*d.*	16	*s.*	*d.*	*f.*	*s.*	*d.*	16	*s.*	*d.*	*f.*	*s.*	*d.*	16
18	1	6	0	1	6	0	1	6	2	1	6	8	1	7	0	1	7	0	1	7	2	1	7	8
20	1	7	0	1	5	2	1	7	2	1	5	9	1	8	0	1	6	0	1	8	2	1	6	7
22	1	7	2	1	3	15	1	8	0	1	4	6	1	8	2	1	4	12	1	9	0	1	5	3
24	1	8	0	1	3	0	1	8	2	1	3	6	1	9	0	1	3	12	1	9	2	1	4	2
26	1	8	2	1	2	3	1	9	0	1	2	9	1	9	2	1	2	14	1	10	0	1	3	4
28	1	9	0	1	1	8	1	9	2	1	1	13	1	10	0	1	2	2	1	10	2	1	2	7

YARN SOLD AT A PRICE FOR NO. 30.

No.	At 1s. 2d.						At 1s. 2½d.						At 1s. 3d.						At 1s. 3½d.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16
30	1	2	0	0	8	6	1	2	2	0	8	11	1	3	0	0	9	0	1	3	2	0	9	5
32	1	2	2	0	8	2	1	3	0	0	8	6	1	3	2	0	8	11	1	4	0	0	9	0
34	1	3	0	0	8	0	1	3	2	0	8	3	1	4	0	0	8	8	1	4	2	0	8	12
36	1	3	2	0	7	12	1	4	0	0	8	0	1	4	2	0	8	4	1	5	0	0	8	8
38	1	4	0	0	7	8	1	4	2	0	7	13	1	5	0	0	8	0	1	5	2	0	8	4
40	1	4	2	0	7	6	1	5	0	0	7	10	1	5	2	0	7	14	1	6	0	0	8	2
42	1	5	0	0	7	4	1	5	2	0	7	8	1	6	0	0	7	11	1	6	2	0	7	15

No.	At 1s. 4d.						At 1s. 4½d.						At 1s. 5d.						At 1s. 5½d.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16
30	1	4	0	0	9	9	1	4	2	0	9	14	1	5	0	0	10	3	1	5	2	0	10	8
32	1	4	2	0	9	4	1	5	0	0	9	9	1	5	2	0	9	15	1	6	0	0	10	2
34	1	5	0	0	9	0	1	5	2	0	9	4	1	6	0	0	9	8	1	6	2	0	9	13
36	1	5	2	0	8	12	1	6	0	0	9	0	1	6	2	0	9	4	1	7	0	0	9	8
38	1	6	0	0	8	8	1	6	2	0	8	12	1	7	0	0	9	0	1	7	2	0	9	3
40	1	6	2	0	8	5	1	7	0	0	8	9	1	7	2	0	8	12	1	8	0	0	9	0
42	1	7	0	0	8	2	1	7	2	0	8	6	1	8	0	0	8	8	1	8	2	0	8	12

No.	At 1s. 6d.						At 1s. 6½d.						At 1s. 7d.						At 1s. 7½d.					
	per lb.			per spy.			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16
30	1	6	0	0	10	13	1	6	2	0	11	1	1	7	0	0	11	6	1	7	2	0	11	11
32	1	6	2	0	10	6	1	7	0	0	10	11	1	7	2	0	11	0	1	8	0	0	11	4
34	1	7	0	0	10	1	1	7	2	0	10	5	1	8	0	0	10	9	1	8	2	0	10	13
36	1	7	2	0	9	12	1	8	0	0	10	0	1	8	2	0	10	4	1	9	0	0	10	8
38	1	8	0	0	9	8	1	8	2	0	9	11	1	9	0	0	9	15	1	9	2	0	10	3
40	1	8	2	0	9	3	1	9	0	0	9	7	1	9	2	0	9	11	1	10	0	0	9	14
42	1	9	0	0	9	0	1	9	2	0	9	3	1	10	0	0	9	7	1	10	2	0	9	10

No.	At 1s. 8d.						At 1s. 8½d.						At 1s. 9d.						At 1s. 9½d.					
	per lb.			per spy			per lb.			per spy.			per lb.			per spy.			per lb.			per spy.		
	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16	s.	d.	f.	s.	d.	16
30	1	8	0	1	0	0	1	8	2	1	0	5	1	9	0	1	0	9	1	9	2	1	0	14
32	1	8	2	0	11	8	1	9	0	0	11	13	1	9	2	1	0	1	1	10	0	1	0	6
34	1	9	0	0	11	2	1	9	2	0	11	6	1	10	0	0	11	10	1	10	2	0	11	15
36	1	9	2	0	10	12	1	10	0	0	11	0	1	10	2	0	11	4	1	11	0	0	11	8
38	1	10	0	0	10	7	1	10	2	0	10	10	1	11	0	0	10	14	1	11	2	0	11	2
40	1	10	2	0	10	2	1	11	0	0	10	5	1	11	2	0	10	9	2	0	0	0	10	13
42	1	11	0	0	9	12	1	11	2	0	10	0	2	0	0	0	10	4	2	0	2	0	10	8

YARN SOLD AT A PRICE FOR NO. 120.

No.	At 3*s.*					At 3*s.* 3*d.*					At 3*s.* 6*d.*					At 3*s.* 9*d.*				
	per lb.		per spy.			per lb.		per spy.			per lb.		per spy.			per lb.		per spy.		
	s.	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16
80	1	6½	0	4	3	1	9½	0	4	13	2	0½	0	5	8	2	3½	0	6	3
82	1	7	0	4	3	1	10	0	4	13	2	1	0	5	8	2	4	0	6	3
84	1	7½	0	4	3	1	10½	0	4	13	2	1½	0	5	8	2	4½	0	6	2
86	1	8	0	4	3	1	11	0	4	13	2	2	0	5	7	2	5	0	6	1
88	1	8½	0	4	3	1	11½	0	4	13	2	2½	0	5	7	2	5½	0	6	0
90	1	9	0	4	3	2	0	0	4	13	2	3	0	5	6	2	6	0	6	0
92	1	10	0	4	5	2	1	0	4	14	2	4	0	5	8	2	7	0	6	1
94	1	11	0	4	6	2	2	0	5	0	2	5	0	5	9	2	8	0	6	2
96	2	0	0	4	8	2	3	0	5	1	2	6	0	5	10	2	9	0	6	3
98	2	1	0	4	9	2	4	0	5	2	2	7	0	5	11	2	10	0	6	4
100	2	2	0	4	11	2	5	0	5	4	2	8	0	5	12	2	11	0	6	5
102	2	3	0	4	12	2	6	0	5	4	2	9	0	5	13	3	0	0	6	5
104	2	4	0	4	13	2	7	0	5	6	2	10	0	5	14	3	1	0	6	6
106	2	5	0	4	15	2	8	0	5	7	2	11	0	5	15	3	2	0	6	7
108	2	6	0	5	0	2	9	0	5	8	3	0	0	6	0	3	3	0	6	8
110	2	7	0	5	1	2	10	0	5	9	3	1	0	6	1	3	4	0	6	8
112	2	8	0	5	2	2	11	0	5	10	3	2	0	6	2	3	5	0	6	9
114	2	9	0	5	3	3	0	0	5	11	3	3	0	6	2	3	6	0	6	10
116	2	10	0	5	4	3	1	0	5	12	3	4	0	6	3	3	7	0	6	11
118	2	11	0	5	5	3	2	0	5	13	3	5	0	6	4	3	8	0	6	11
120	3	0	0	5	6	3	3	0	5	14	3	6	0	6	5	3	9	0	6	12
122	3	2	0	5	9	3	5	0	6	0	3	8	0	6	8	3	11	0	6	15
124	3	4	0	5	13	3	7	0	6	4	3	10	0	6	11	4	1	0	7	2
126	3	6	0	6	0	3	9	0	6	7	4	0	0	6	14	4	3	0	7	4
128	3	8	0	6	3	3	11	0	6	9	4	2	0	7	0	4	5	0	7	7
130	3	10	0	6	5	4	1	0	6	12	4	4	0	7	3	4	7	0	7	10
132	4	0	0	6	8	4	3	0	7	0	4	6	0	7	6	4	9	0	7	12
134	4	2	0	6	11	4	5	0	7	2	4	8	0	7	8	4	11	0	7	15
136	4	4	0	6	14	4	7	0	7	4	4	10	0	7	11	5	1	0	8	1
138	4	6	0	7	0	4	9	0	7	7	5	0	0	7	13	5	3	0	8	3
140	4	9	0	7	5	5	0	0	7	11	5	3	0	8	1	5	6	0	8	8
142	5	0	0	7	10	5	3	0	8	0	5	6	0	8	6	5	9	0	8	12
144	5	3	0	7	14	5	6	0	8	4	5	9	0	8	10	6	0	0	9	0
146	5	6	0	8	2	5	9	0	8	8	6	0	0	8	14	6	3	0	9	4
148	5	9	0	8	6	6	0	0	8	12	6	3	0	9	2	6	6	0	9	8
150	6	0	0	8	10	6	3	0	9	0	6	6	0	9	6	6	9	0	9	12
152	6	3	0	8	14	6	6	0	9	4	6	9	0	9	9	7	0	0	10	0
154	6	6	0	9	2	6	9	0	9	8	7	0	0	9	13	7	3	0	10	3
156	6	9	0	9	6	7	0	0	9	11	7	3	0	10	0	7	6	0	10	6
158	7	1	0	9	11	7	4	0	10	0	7	7	0	10	6	7	10	0	10	11

YARN SOLD AT A PRICE FOR NO. 120.

No.	At 3*s.*					At 3*s.* 3*d.*					At 3*s.* 6*d.*					At 3*s.* 9*d.*				
	per lb.		per spy.			per lb.		per spy.			per lb.		per spy.			per lb.		per spy.		
	s.	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16
160	7	5	0	10	0	7	8	0	10	6	7	11	0	10	11	8	2	0	11	0
162	7	9	0	10	5	8	0	0	10	11	8	3	0	11	0	8	6	0	11	5
164	8	1	0	10	10	8	4	0	11	0	8	7	0	11	4	8	10	0	11	10
166	8	6	0	11	1	8	9	0	11	6	9	0	0	11	11	9	3	1	0	0
168	8	11	0	11	8	9	2	0	11	12	9	5	1	0	2	9	8	1	0	7
170	9	4	0	11	14	9	7	1	0	3	9	10	1	0	8	10	1	1	0	13
172	9	9	1	0	4	10	0	1	0	9	10	3	1	0	14	10	6	1	1	3
174	10	2	1	0	10	10	5	1	0	15	10	8	1	1	4	10	11	1	1	8
176	10	7	1	1	0	10	10	1	1	4	11	1	1	1	9	11	4	1	1	14
178	11	0	1	1	5	11	3	1	1	10	11	6	1	2	0	11	9	1	2	4
180	11	5	1	1	11	11	8	1	2	0	11	11	1	2	5	12	2	1	2	10
182	11	10	1	2	0	12	1	1	2	5	12	4	1	2	10	12	7	1	2	15
184	12	3	1	2	6	12	6	1	2	11	12	9	1	3	0	13	0	1	3	4
186	12	8	1	2	11	12	11	1	3	0	13	2	1	3	4	13	5	1	3	8
188	13	1	1	3	0	13	4	1	3	5	13	7	1	3	9	13	10	1	3	14
190	13	6	1	3	5	13	9	1	3	10	14	0	1	3	15	14	3	1	4	3
192	13	11	1	3	10	14	2	1	3	15	14	5	1	4	3	14	8	1	4	8
194	14	5	1	4	0	14	8	1	4	5	14	11	1	4	9	15	2	1	4	14
196	14	11	1	4	8	15	2	1	4	12	15	5	1	5	1	15	8	1	5	5
198	15	5	1	4	13	15	8	1	5	1	15	11	1	5	6	16	2	1	5	10
200	15	11	1	5	3	16	2	1	5	8	16	5	1	5	12	16	8	1	6	0
202	16	7	1	5	12	16	10	1	6	0	17	1	1	6	4	17	4	1	6	8
204	17	3	1	6	4	17	6	1	6	8	17	9	1	6	12	18	0	1	7	0
206	17	11	1	6	12	18	2	1	7	0	18	5	1	7	4	18	8	1	7	8
208	18	7	1	7	4	18	10	1	7	8	19	1	1	7	13	19	4	1	8	0
210	19	3	1	7	12	19	6	1	8	0	19	9	1	8	5	20	0	1	8	8
212	19	11	1	8	4	20	2	1	8	8	20	5	1	8	13	20	8	1	9	1
214	20	7	1	8	12	20	10	1	9	0	21	1	1	9	4	21	4	1	9	8
216	21	3	1	9	4	21	6	1	9	8	21	9	1	9	12	22	0	1	10	0
218	21	11	1	9	11	22	2	1	9	15	22	5	1	10	3	22	8	1	10	7
220	22	7	1	10	3	22	10	1	10	7	23	1	1	10	10	23	4	1	10	15
222	23	3	1	10	12	23	8	1	11	0	23	11	1	11	4	24	2	1	11	8
224	24	3	1	11	5	24	6	1	11	9	24	9	1	11	13	25	0	2	0	1
226	25	1	2	0	0	25	4	2	0	3	25	7	2	0	7	25	10	2	0	11
228	25	11	2	0	8	26	2	2	0	12	26	5	2	1	0	26	8	2	1	5
230	26	9	2	1	1	27	0	2	1	5	27	3	2	1	9	27	6	2	1	13
232	27	7	2	1	10	27	10	2	1	14	28	1	2	2	2	28	4	2	2	5
234	28	5	2	2	4	28	8	2	2	8	28	11	2	2	11	29	2	2	2	15
236	29	3	2	2	12	29	6	2	3	0	29	9	2	3	3	30	0	2	3	7
238	30	1	2	3	4	30	4	2	3	8	30	7	2	3	12	30	10	2	4	0

YARN SOLD AT A PRICE FOR NO. 129.

No.	At 4*s.*					At 4*s.* 8*d.*					At 4*s.* 6*d.*					At 4*s.* 9*d.*				
	per lb.		per spy.			per lb.		per spy.			per lb.		per spy.			per lb.		per spy.		
	s.	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16
80	2	6½	0	6	14	2	9½	0	7	8	3	0½	0	8	3	3	3½	0	8	14
82	2	7	0	6	13	2	10	0	7	8	3	1	0	8	2	3	4	0	8	13
84	2	7½	0	6	12	2	10½	0	7	6	3	1½	0	8	0	3	4½	0	8	11
86	2	8	0	6	11	2	11	0	7	5	3	2	0	8	0	3	5	0	8	9
88	2	8½	0	6	10	2	11½	0	7	4	3	2½	0	7	14	3	5½	0	8	8
90	2	9	0	6	9	3	0	0	7	3	3	3	0	7	13	3	6	0	8	6
92	2	10	0	6	10	3	1	0	7	4	3	4	0	7	13	3	7	0	8	6
94	2	11	0	6	11	3	2	0	7	4	3	5	0	7	14	3	8	0	8	7
96	3	0	0	6	12	3	3	0	7	5	3	6	0	7	14	3	9	0	8	7
98	3	1	0	6	13	3	4	0	7	5	3	7	0	7	14	3	10	0	8	8
100	3	2	0	6	13	3	5	0	7	6	3	8	0	7	15	3	11	0	8	8
102	3	3	0	6	14	3	6	0	7	7	3	9	0	7	15	4	0	0	8	8
104	3	4	0	6	15	3	7	0	7	8	3	10	0	8	0	4	1	0	8	8
106	3	5	0	7	0	3	8	0	7	8	3	11	0	8	0	4	2	0	8	8
108	3	6	0	7	0	3	9	0	7	8	4	0	0	8	0	4	3	0	8	8
110	3	7	0	7	0	3	10	0	7	8	4	1	0	8	0	4	4	0	8	8
112	3	8	0	7	1	3	11	0	7	9	4	2	0	8	0	4	5	0	8	8
114	3	9	0	7	2	4	0	0	7	9	4	3	0	8	1	4	6	0	8	8
116	3	10	0	7	3	4	1	0	7	10	4	4	0	8	1	4	7	0	8	9
118	3	11	0	7	3	4	2	0	7	10	4	5	0	8	1	4	8	0	8	9
120	4	0	0	7	2	4	3	0	7	9	4	6	0	8	0	4	9	0	8	7
122	4	2	0	7	6	4	5	0	7	13	4	8	0	8	4	4	11	0	8	11
124	4	4	0	7	8	4	7	0	8	0	4	10	0	8	7	5	1	0	8	14
126	4	6	0	7	11	4	9	0	8	2	5	0	0	8	9	5	3	0	9	0
128	4	8	0	7	14	4	11	0	8	4	5	2	0	8	12	5	5	0	9	2
130	4	10	0	8	0	5	1	0	8	8	5	4	0	8	14	5	7	0	9	4
132	5	0	0	8	3	5	3	0	8	9	5	6	0	9	0	5	9	0	9	6
134	5	2	0	8	5	5	5	0	8	11	5	8	0	9	2	5	11	0	9	8
136	5	4	0	8	8	5	7	0	8	14	5	10	0	9	4	6	1	0	9	11
138	5	6	0	8	10	5	9	0	9	0	6	0	0	9	6	6	3	0	9	12
140	5	9	0	8	14	6	0	0	9	4	6	3	0	9	10	6	6	0	10	0
142	6	0	0	9	2	6	3	0	9	8	6	6	0	9	14	6	9	0	10	4
144	6	3	0	9	6	6	6	0	9	12	6	9	0	10	2	7	0	0	10	8
146	6	6	0	9	10	6	9	0	10	0	7	0	0	10	6	7	3	0	10	12
148	6	9	0	9	14	7	0	0	10	3	7	3	0	10	9	7	6	0	11	0
150	7	0	0	10	1	7	3	0	10	7	7	6	0	10	13	7	9	0	11	3
152	7	3	0	10	5	7	6	0	10	10	7	9	0	11	0	8	0	0	11	6
154	7	6	0	10	8	7	9	0	10	14	8	0	0	11	3	8	3	0	11	9
156	7	9	0	10	12	7	0	0	11	1	8	3	0	11	7	8	6	0	11	12
158	8	1	0	11	0	7	4	0	11	6	8	7	0	11	12	8	10	1	0	1

YARN SOLD AT A PRICE FOR NO. 120.

No.	At 4*s.*					At 4*s.* 3*d.*					At 4*s.* 6*d.*					At 4*s.* 9*d.*				
	per lb.		per spy.			per lb.		per spy.			per lb.		per spy.			per lb.		per spy.		
	s.	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16
160	8	5	0	11	6	8	8	0	11	11	8	11	1	0	0	9	2	1	0	6
162	8	9	0	11	11	9	0	1	0	0	9	3	1	0	5	9	6	1	0	11
164	9	1	1	0	0	9	4	1	0	4	9	7	1	0	10	9	10	1	1	0
166	9	6	1	0	6	9	9	1	0	11	10	0	1	1	0	10	3	1	1	5
168	9	11	1	0	12	10	2	1	1	1	10	5	1	1	6	10	8	1	1	11
170	10	4	1	1	2	10	7	1	1	7	10	10	1	1	12	11	1	1	2	1
172	10	9	1	1	8	11	0	1	1	13	11	3	1	2	2	11	6	1	2	7
174	11	2	1	1	14	11	5	1	2	3	11	8	1	2	8	11	11	1	2	12
176	11	7	1	2	2	11	10	1	2	8	12	1	1	2	13	12	4	1	3	2
178	12	0	1	2	9	12	3	1	2	14	12	6	1	3	2	12	9	1	3	8
180	12	5	1	2	14	12	8	1	3	3	12	11	1	3	8	13	2	1	3	13
182	12	10	1	3	3	13	1	1	3	8	13	4	1	3	13	13	7	1	4	1
184	13	3	1	3	8	13	6	1	3	13	13	9	1	4	2	14	0	1	4	7
186	13	8	1	3	14	13	11	1	4	2	14	2	1	4	7	14	5	1	4	12
188	14	1	1	4	3	14	4	1	4	8	14	7	1	4	12	14	10	1	5	0
190	14	6	1	4	8	14	9	1	4	12	15	0	1	5	0	15	3	1	5	5
192	14	11	1	4	12	15	2	1	5	1	15	5	1	5	5	15	8	1	5	10
194	15	5	1	5	2	15	8	1	5	7	15	11	1	5	11	16	2	1	6	0
196	15	11	1	5	10	16	2	1	5	14	16	5	1	6	3	16	8	1	6	7
198	16	5	1	5	14	16	8	1	6	3	16	11	1	6	7	17	2	1	6	12
200	16	11	1	6	4	17	2	1	6	8	17	5	1	6	13	17	8	1	7	1
202	17	7	1	6	13	17	10	1	7	1	18	1	1	7	5	18	4	1	7	10
204	18	3	1	7	5	18	6	1	7	9	18	9	1	7	14	19	0	1	8	2
206	18	11	1	7	13	19	2	1	8	1	19	5	1	8	5	19	8	1	8	10
208	19	7	1	8	5	19	10	1	8	9	20	1	1	8	13	20	4	1	9	2
210	20	3	1	8	13	20	6	1	9	1	20	9	1	9	5	21	0	1	9	9
212	20	11	1	9	5	21	2	1	9	9	21	5	1	9	13	21	8	1	10	1
214	21	7	1	9	12	21	10	1	10	0	22	1	1	10	4	22	4	1	10	8
216	22	3	1	10	4	22	6	1	10	8	22	9	1	10	12	23	0	1	11	0
218	22	11	1	10	11	23	2	1	10	15	23	5	1	11	3	23	8	1	11	7
220	23	7	1	11	2	23	10	1	11	6	24	1	1	11	10	24	4	1	11	14
222	24	5	1	11	12	24	8	2	0	0	24	11	2	0	3	25	2	2	0	8
224	25	3	2	0	5	25	6	2.	0	9	25	9	2	0	13	26	0	2	1	1
226	26	1	2	0	15	26	4	2	1	2	26	7	2	1	6	26	10	2	1	10
228	26	11	2	1	9	27	2	2	1	12	27	5	2	1	15	27	8	2	2	3
230	27	9	2	2	0	28	0	2	2	4	28	3	2	2	8	28	6	2	2	12
232	28	7	2	2	9	28	10	2	2	13	29	1	2	3	0	29	4	2	3	4
234	29	5	2	3	2	29	8	2	3	6	29	11	2	3	10	30	2	2	3	13
236	30	3	2	3	11	30	6	2	3	14	30	9	2	4	2	31	0	2	4	5
238	31	1	2	4	3	31	4	2	4	7	31	7	2	4	10	31	10	2	4	14

YARN SOLD AT A PRICE FOR NO. 120.

No.	At 5*s*.					At 5*s*. 3*d*.					At 5*s*. 6*d*.					At 5*s*. 9*d*.				
	per lb.		per spy.			per lb.		per spy.			per lb.		per spy.			per lb.		per spy.		
	s.	*d*.	*s*.	*d*.	16	*s*.	*d*:	*s*.	*d*.	16	*s*.	*d*.	*s*.	*d*.	16	*s*.	*d*.	*s*.	*d*.	16
80	3	6½	0	9	9	3	9½	0	10	4	4	0½	0	10	15	4	3½	0	11	9
82	3	7	0	9	7	3	10	0	10	1	4	1	0	10	12	4	4	0	11	7
84	3	7½	0	9	5	3	10½	0	10	0	4	1½	0	10	10	4	4½	0	11	4
86	3	8	0	9	3	3	11	0	9	13	4	2	0	10	8	4	5	0	11	1
88	3	8½	0	9	2	3	11½	0	9	11	4	2½	0	10	5	4	5½	0	10	15
90	3	9	0	9	0	4	0	0	9	10	4	3	0	10	3	4	6	0	10	13
92	3	10	0	9	0	4	1	0	9	9	4	4	0	10	2	4	7	0	10	12
94	3	11	0	9	0	4	2	0	9	9	4	5	0	10	2	4	8	0	10	12
96	4	0	0	9	0	4	3	0	9	9	4	6	0	10	2	4	9	0	10	11
98	4	1	0	9	0	4	4	0	9	9	4	7	0	10	2	4	10	0	10	10
100	4	2	0	9	0	4	5	0	9	9	4	8	0	10	1	4	11	0	10	10
102	4	3	0	9	0	4	6	0	9	8	4	9	0	10	1	5	0	0	10	9
104	4	4	0	9	0	4	7	0	9	8	4	10	0	10	0	5	1	0	10	9
106	4	5	0	9	0	4	8	0	9	8	4	11	0	10	0	5	2	0	10	8
108	4	6	0	9	0	4	9	0	9	8	5	0	0	10	0	5	3	0	10	8
110	4	7	0	9	0	4	10	0	9	8	5	1	0	10	0	5	4	0	10	8
112	4	8	0	9	0	4	11	0	9	8	5	2	0	10	0	5	5	0	10	8
114	4	9	0	9	0	5	0	0	9	8	5	3	0	10	0	5	6	0	10	8
116	4	10	0	9	0	5	1	0	9	8	5	4	0	10	0	5	7	0	10	8
118	4	11	0	9	0	5	2	0	9	8	5	5	0	10	0	5	8	0	10	6
120	5	0	0	8	15	5	3	0	9	6	5	6	0	9	13	5	9	0	10	4
122	5	2	0	9	2	5	5	0	9	9	5	8	0	10	0	5	11	0	10	8
124	5	4	0	9	4	5	7	0	9	12	5	10	0	10	3	6	1	0	10	9
126	5	6	0	9	7	5	9	0	9	14	6	0	0	10	4	6	3	0	10	11
128	5	8	0	9	9	5	11	0	10	0	6	2	0	10	7	6	5	0	10	13
130	5	10	0	9	11	6	1	0	10	2	6	4	0	10	8	6	7	0	10	15
132	6	0	0	9	13	6	3	0	10	4	6	6	0	10	10	6	9	0	11	0
134	6	2	0	9	15	6	5	0	10	5	6	8	0	10	12	6	11	0	11	2
136	6	4	0	10	1	6	7	0	10	7	6	10	0	10	14	7	1	0	11	4
138	6	6	0	10	3	6	9	0	10	9	7	0	0	11	0	7	3	0	11	6
140	6	9	0	10	6	7	0	0	10	12	7	3	0	11	3	7	6	0	11	9
142	7	0	0	10	10	7	3	0	11	0	7	6	0	11	6	7	9	0	11	12
144	7	3	0	10	14	7	6	0	11	4	7	9	0	11	10	8	0	1	0	0
146	7	6	0	11	1	7	9	0	11	7	8	0	0	11	13	8	3	1	0	3
148	7	9	0	11	5	8	0	0	11	11	8	3	1	0	0	8	6	1	0	6
150	8	0	0	11	8	8	3	0	11	14	8	6	1	0	4	8	9	1	0	10
152	8	3	0	11	12	8	6	1	0	1	8	9	1	0	7	9	0	1	0	12
154	8	6	0	11	15	8	9	1	0	4	9	0	1	0	10	9	3	1	1	0
156	8	9	1	0	2	9	0	1	0	8	9	3	1	0	13	9	6	1	1	2
158	9	1	1	0	7	9	4	1	0	12	9	7	1	1	1	10	0	1	1	7

YARN SOLD AT A PRICE FOR NO. 120.

No.	At 5*s*.					At 5*s*. 3*d*.					At 5*s*. 6*d*.					At 5*s*. 9*d*.				
	per lb.		per spy.			per lb.		per spy.			per lb.		per spy.			per lb.		per spy.		
	s.	*d*.	*s*.	*d*.	16	*s*.	*d*.	*s*.	*d*.	16	*s*.	*d*.	*s*.	*d*.	16	*s*.	*d*.	*s*.	*d*.	16
160	9	5	1	0	11	9	8	1	1	0	9	11	1	1	6	10	2	1	1	12
162	9	9	1	1	0	10	0	1	1	5	10	3	1	1	11	10	6	1	2	0
164	10	1	1	1	4	10	4	1	1	10	10	7	1	1	15	10	10	1	2	4
166	10	6	1	1	10	10	9	1	2	0	11	0	1	2	5	11	3	1	2	10
168	10	11	1	2	0	11	2	1	2	5	11	5	1	2	11	11	8	1	3	0
170	11	4	1	2	6	11	7	1	2	11	11	10	1	3	0	12	1	1	3	5
172	11	9	1	2	12	12	0	1	3	1	12	3	1	3	6	12	6	1	3	11
174	12	2	1	3	1	12	5	1	3	6	12	8	1	3	11	12	11	1	4	0
176	12	7	1	3	7	12	10	1	3	12	13	1	1	4	0	13	4	1	4	5
178	13	0	1	3	12	13	3	1	4	1	13	6	1	4	6	13	9	1	4	11
180	13	5	1	4	1	13	8	1	4	6	13	11	1	4	11	14	2	1	5	0
182	13	10	1	4	6	14	1	1	4	11	14	4	1	5	0	14	7	1	5	4
184	14	3	1	4	12	14	6	1	5	0	14	9	1	5	5	15	0	1	5	9
186	14	8	1	5	0	14	11	1	5	5	15	2	1	5	9	15	5	1	5	14
188	15	1	1	5	5	15	4	1	5	10	15	7	1	5	14	15	10	1	6	3
190	15	6	1	5	10	15	9	1	5	14	16	0	1	6	3	16	3	1	6	8
192	15	11	1	5	14	16	2	1	6	3	16	5	1	6	8	16	8	1	6	12
194	16	5	1	6	4	16	8	1	6	9	16	11	1	6	13	17	2	1	7	1
196	16	11	1	6	11	17	2	1	7	0	17	5	1	7	4	17	8	1	7	9
198	17	5	1	7	0	17	8	1	7	4	17	11	1	7	9	18	2	1	7	13
200	17	11	1	7	5	18	2	1	7	10	18	5	1	7	14	18	8	1	8	2
202	18	7	1	7	14	18	10	1	8	2	19	1	1	8	6	19	4	1	8	11
204	19	3	1	8	6	19	6	1	8	10	19	9	1	8	15	20	0	1	9	3
206	19	11	1	8	14	20	2	1	9	2	20	5	1	9	6	20	8	1	9	10
208	20	7	1	9	6	20	10	1	9	10	21	1	1	9	14	21	4	1	10	2
210	21	3	1	9	14	21	6	1	10	2	21	9	1	10	6	22	0	1	10	10
212	21	11	1	10	5	22	2	1	10	9	22	5	1	10	13	22	8	1	11	2
214	22	7	1	10	12	22	10	1	11	0	23	1	1	11	4	23	4	1	11	8
216	23	3	1	11	4	23	6	1	11	8	23	9	1	11	12	24	0	2	0	0
218	23	11	1	11	11	24	2	1	11	15	24	5	2	0	3	24	8	2	0	7
220	24	7	2	0	2	24	10	2	0	6	25	1	2	0	10	25	4	2	0	14
222	25	5	2	0	11	25	8	2	1	0	25	11	2	1	3	26	2	2	1	8
224	26	3	2	1	4	26	6	2	1	8	26	9	2	1	12	27	0	2	2	0
226	27	1	2	1	14	27	4	2	2	2	27	7	2	2	5	27	10	2	2	9
228	27	11	2	2	7	28	2	2	2	11	28	5	2	2	15	28	8	2	3	2
230	28	9	2	3	0	29	0	2	3	3	29	3	2	3	8	29	6	2	3	11
232	29	7	2	3	8	29	10	2	3	12	31	1	2	4	0	30	4	2	4	3
234	30	5	2	4	1	30	8	2	4	4	30	11	2	4	8	31	2	2	4	12
236	31	3	2	4	9	31	6	2	4	13	31	9	2	5	0	32	0	2	5	4
238	32	1	2	5	2	32	4	2	5	5	32	7	2	5	9	32	10	2	5	12

YARN SOLD AT A PRICE FOR NO. 120.

No.	At 6*s.*					At 6*s.* 3*d.*					At 6*s.* 6*d.*					At 6*s.* 9*d.*				
	per lb.		per spy.			per lb.		per spy.			per lb.		per spy.			per lb.		per spy.		
	s.	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16
80	4	6½	1	0	4	4	9½	1	0	15	5	0½	1	1	10	5	3½	1	2	4
82	4	7	1	0	3	4	10	1	0	13	5	1	1	1	9	5	4	1	2	4
84	4	7½	0	11	14	4	10½	1	0	8	5	1½	1	1	3	5	4½	1	1	13
86	4	8	0	11	12	4	11	1	0	5	5	2	1	1	0	5	5	1	1	10
88	4	8½	0	11	10	4	11½	1	0	4	5	2½	1	0	14	5	5½	1	1	8
90	4	9	0	11	6	5	0	1	0	0	5	3	1	0	9	5	6	1	1	3
92	4	10	0	11	5	5	1	0	11	15	5	4	1	0	8	5	7	1	1	2
94	4	11	0	11	4	5	2	0	11	14	5	5	1	0	8	5	8	1	1	0
96	5	0	0	11	4	5	3	0	11	13	5	6	1	0	6	5	9	1	0	15
98	5	1	0	11	3	5	4	0	11	12	5	7	1	0	5	5	10	1	0	14
100	5	2	0	11	3	5	5	0	11	11	5	8	1	0	4	5	11	1	0	12
102	5	3	0	11	2	5	6	0	11	10	5	9	1	0	3	6	0	1	0	11
104	5	4	0	11	1	5	7	0	11	9	5	10	1	0	2	6	1	1	0	10
106	5	5	0	11	0	5	8	0	11	8	5	11	1	0	1	6	2	1	0	9
108	5	6	0	11	0	5	9	0	11	8	6	0	1	0	0	6	3	1	0	8
110	5	7	0	11	0	5	10	0	11	8	6	1	1	0	0	6	4	1	0	7
112	5	8	0	10	15	5	11	0	11	7	6	2	0	11	14	6	5	1	0	6
114	5	9	0	10	14	6	0	0	11	6	6	3	0	11	14	6	6	1	0	5
116	5	10	0	11	0	6	1	0	11	8	6	4	0	11	15	6	7	1	0	5
118	5	11	0	10	13	6	2	0	11	4	6	5	0	11	12	6	8	1	0	3
120	6	0	0	10	12	6	3	0	11	2	6	6	0	11	10	6	9	1	0	0
122	6	2	0	10	12	6	5	0	11	5	6	8	0	11	12	6	11	1	0	4
124	6	4	0	11	0	6	7	0	11	8	6	10	0	11	15	7	1	1	0	6
126	6	6	0	11	2	6	9	0	11	9	7	0	1	0	0	7	3	1	0	7
128	6	8	0	11	4	6	11	0	11	11	7	2	1	0	1	7	5	1	0	8
130	6	10	0	11	6	7	1	0	11	12	7	4	1	0	3	7	7	1	0	10
132	7	0	0	11	8	7	3	0	11	14	7	6	1	0	4	7	9	1	0	11
134	7	2	0	11	8	7	5	0	11	15	7	8	1	0	5	7	11	1	0	12
136	7	4	0	11	10	7	7	1	0	0	7	10	1	0	7	8	1	1	0	13
138	7	6	0	11	12	7	9	1	0	2	8	0	1	0	8	8	3	1	0	14
140	7	9	0	11	15	8	0	1	0	5	8	3	1	0	8	8	6	1	1	1
142	8	0	1	0	3	8	3	1	0	8	8	6	1	0	15	8	9	1	1	5
144	8	3	1	0	6	8	6	1	0	10	8	9	1	1	2	9	0	1	1	8
146	8	6	1	0	9	8	9	1	0	15	9	0	1	1	5	9	3	1	1	11
148	8	9	1	0	12	9	0	1	1	2	9	3	1	1	8	9	6	1	1	14
150	9	0	1	1	0	9	3	1	1	5	9	6	1	1	11	9	9	1	2	0
152	9	3	1	1	2	9	6	1	1	8	9	9	1	1	14	10	0	1	2	3
154	9	6	1	1	5	9	9	1	1	11	10	0	1	2	0	10	3	1	2	6
156	9	9	1	1	8	10	0	1	1	14	10	3	1	2	3	10	6	1	2	8
158	10	1	1	1	12	10	4	1	2	2	10	7	1	2	8	10	10	1	2	11

YARN SOLD AT A PRICE FOR NO. 120.

No.	At 6*s*.					At 6*s*. 3*d*.					At 6*s*. 6*d*.					At 6*s*. 9*d*.				
	per lb.		per spy.			per lb.		per spy.			per lb.		per spy.			per lb.		per spy.		
	s.	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16
160	10	5	1	2	1	10	8	1	2	6	10	11	1	2	12	11	2	1	3	1
162	10	9	1	2	5	11	0	1	2	10	11	3	1	3	0	11	6	1	3	5
164	11	1	1	2	9	11	4	1	2	15	11	7	1	3	4	11	10	1	3	9
166	11	6	1	3	0	11	9	1	3	4	12	0	1	3	8	12	3	1	3	13
168	11	11	1	3	5	12	2	1	3	10	12	5	1	4	0	12	8	1	4	4
170	12	4	1	3	10	12	7	1	4	0	12	10	1	4	4	13	1	1	4	10
172	12	9	1	4	0	13	0	1	4	5	13	3	1	4	10	13	6	1	4	15
174	13	2	1	4	5	13	5	1	4	10	13	8	1	4	15	13	11	1	5	4
176	13	7	1	4	10	13	10	1	5	0	14	1	1	5	4	14	4	1	5	9
178	14	0	1	5	0	14	3	1	5	4	14	6	1	5	9	14	9	1	5	14
180	14	5	1	5	5	14	8	1	5	9	14	11	1	5	15	15	2	1	6	3
182	14	10	1	5	9	15	1	1	5	14	15	4	1	6	3	15	7	1	6	8
184	15	3	1	5	14	15	6	1	6	3	15	9	1	6	8	16	0	1	6	12
186	15	8	1	6	3	15	11	1	6	8	16	2	1	6	12	16	5	1	7	0
188	16	1	1	6	8	16	4	1	6	12	16	7	1	7	0	16	10	1	7	5
190	16	6	1	6	12	16	9	1	7	0	17	0	1	7	5	17	3	1	7	10
192	16	11	1	7	0	17	2	1	7	5	17	5	1	7	9	17	8	1	7	14
194	17	5	1	7	6	17	8	1	7	10	17	11	1	7	15	18	2	1	8	3
196	17	11	1	7	13	18	2	1	8	1	18	5	1	8	6	18	8	1	8	11
198	18	5	1	8	1	18	8	1	8	6	18	11	1	8	10	19	2	1	8	14
200	18	11	1	8	7	19	2	1	8	11	19	5	1	9	0	19	8	1	9	4
202	19	7	1	8	15	19	10	1	9	3	20	1	1	9	8	20	4	1	9	12
204	20	3	1	9	7	20	6	1	9	11	20	9	1	10	0	21	0	1	10	3
206	20	11	1	9	15	21	2	1	10	3	21	5	1	10	7	21	8	1	10	11
208	21	7	1	10	6	21	10	1	10	11	22	1	1	10	15	22	4	1	11	3
210	22	3	1	10	14	22	6	1	11	2	22	9	1	11	6	23	0	1	11	11
212	22	11	1	11	6	23	2	1	11	10	23	5	1	11	14	23	8	2	0	2
214	23	7	1	11	13	23	10	2	0	0	24	1	2	0	5	24	4	2	0	9
216	24	3	2	0	4	24	6	2	0	8	24	9	2	0	12	25	0	2	1	0
218	24	11	2	0	11	25	2	2	0	15	25	5	2	1	3	25	8	2	1	6
220	25	7	2	1	2	25	10	2	1	5	26	1	2	1	10	26	4	2	1	13
222	26	5	2	1	11	26	8	2	1	15	26	11	2	2	3	27	2	2	2	6
224	27	3	2	2	4	27	6	2	2	8	27	9	2	2	12	28	0	2	3	0
226	28	1	2	2	13	28	4	2	3	1	28	7	2	3	5	28	10	2	3	8
228	28	11	2	3	6	29	2	2	3	10	29	5	2	3	14	29	8	2	4	0
230	29	9	2	3	11	30	0	2	3	15	30	3	2	4	3	30	6	2	4	7
232	30	7	2	4	8	30	10	2	4	11	31	1	2	4	15	31	4	2	5	2
234	31	5	2	5	0	31	8	2	5	4	31	11	2	5	8	32	2	2	5	11
236	32	3	2	5	8	32	6	2	5	11	32	9	2	5	15	33	0	2	6	2
238	33	1	2	6	0	33	4	2	6	4	33	7	2	6	8	33	10	2	6	11

YARN SOLD AT A PRICE FOR NO. 120.

No.	At 7*s.*					At 7*s.* 3*d.*					At 7*s.* 6*d.*					At 7*s.* 9*d.*				
	per lb.		per spy.			per lb.		per spy.			per lb.		per spy.			per lb.		per spy.		
	s.	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16
80	5	6½	1	3	0	5	9½	1	3	10	6	0½	1	4	5	6	3½	1	5	0
82	5	7	1	2	14	5	10	1	3	9	6	1	1	4	4	6	4	1	4	14
84	5	7½	1	2	8	5	10½	1	3	2	6	1½	1	3	11	6	4½	1	4	4
86	5	8	1	2	4	5	11	1	2	14	6	2	1	3	8	6	5	1	4	2
88	5	8½	1	2	2	5	11½	1	2	12	6	2½	1	3	5	6	5½	1	4	0
90	5	9	1	1	13	6	0	1	2	6	6	3	1	3	0	6	6	1	3	10
92	5	10	1	1	11	6	1	1	2	4	6	4	1	2	14	6	7	1	3	8
94	5	11	1	1	9	6	2	1	2	3	6	5	1	2	12	6	8	1	3	5
96	6	0	1	1	8	6	3	1	2	1	6	6	1	2	10	6	9	1	3	3
98	6	1	1	1	6	6	4	1	2	0	6	7	1	2	8	6	10	1	3	1
100	6	2	1	1	5	6	5	1	1	14	6	8	1	2	6	6	11	1	3	0
102	6	3	1	1	4	6	6	1	1	12	6	9	1	2	6	7	0	1	2	15
104	6	4	1	1	2	6	7	1	1	11	6	10	1	2	3	7	1	1	2	11
106	6	5	1	1	1	6	8	1	1	9	6	11	1	2	1	7	2	1	2	10
108	6	6	1	1	0	6	9	1	1	8	7	0	1	2	0	7	3	1	2	8
110	6	7	1	0	15	6	10	1	1	7	7	1	1	1	15	7	4	1	2	6
112	6	8	1	0	14	6	11	1	1	5	7	2	1	1	13	7	5	1	2	5
114	6	9	1	0	13	7	0	1	1	6	7	3	1	1	14	7	6	1	2	5
116	6	10	1	0	12	7	1	1	1	4	7	4	1	1	12	7	7	1	2	3
118	6	11	1	0	11	7	2	1	1	2	7	5	1	1	9	7	8	1	2	0
120	7	0	1	0	8	7	3	1	1	0	7	6	1	1	6	7	9	1	1	14
122	7	2	1	0	11	7	5	1	1	2	7	8	1	1	9	7	11	1	2	0
124	7	4	1	0	12	7	7	1	1	3	7	10	1	1	10	8	1	1	2	1
126	7	6	1	0	14	7	9	1	1	4	8	0	1	1	11	8	3	1	2	2
128	7	8	1	0	15	7	11	1	1	5	8	2	1	1	12	8	5	1	2	3
130	7	10	1	1	0	8	1	1	1	7	8	4	1	1	14	8	7	1	2	4
132	8	0	1	1	1	8	3	1	1	8	8	6	1	1	14	8	9	1	2	5
134	8	2	1	1	2	8	5	1	1	8	8	8	1	1	15	8	11	1	2	5
136	8	4	1	1	4	8	7	1	1	10	8	10	1	2	0	9	1	1	2	7
138	8	6	1	1	5	8	9	1	1	11	9	0	1	2	1	9	3	1	2	8
140	8	9	1	1	8	9	0	1	1	14	9	3	1	2	4	9	6	1	2	10
142	9	0	1	1	11	9	3	1	2	1	9	6	1	2	7	9	9	1	2	13
144	9	3	1	1	14	9	6	1	2	4	9	9	1	2	10	10	0	1	3	0
146	9	6	1	2	1	9	9	1	2	7	10	0	1	2	12	10	3	1	3	3
148	9	9	1	2	4	10	0	1	2	9	10	3	1	2	15	10	6	1	3	5
150	10	0	1	2	6	10	3	1	2	12	10	6	1	3	2	10	9	1	3	8
152	10	3	1	2	9	10	6	1	2	15	10	9	1	3	4	11	0	1	3	10
154	10	6	1	2	11	10	9	1	3	1	11	0	1	3	7	11	3	1	3	12
156	10	9	1	2	14	11	0	1	3	4	11	3	1	3	9	11	6	1	3	15
158	11	1	1	3	0	11	4	1	3	6	11	7	1	3	12	11	10	1	4	1

YARN SOLD AT A PRICE FOR NO. 120.

No.	At 7*s.*					At 7*s.* 3*d.*					At 7*s.* 6*d.*					At 7*s.* 9*d.*				
	per lb.		per spy.			per lb.		per spy.			per lb.		per spy.			per lb.		per spy.		
	s.	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16	*s.*	*d.*	*s.*	*d.*	16
160	11	5	1	3	6	11	8	1	3	12	11	11	1	4	1	12	2	1	4	6
162	11	9	1	3	11	12	0	1	4	0	12	3	1	4	5	12	6	1	4	11
164	12	1	1	3	14	12	4	1	4	4	12	7	1	4	9	12	10	1	4	14
166	12	6	1	4	3	12	9	1	4	8	13	0	1	4	13	13	3	1	5	2
168	12	11	1	4	9	13	2	1	4	15	13	5	1	5	4	13	8	1	5	9
170	13	4	1	4	15	13	7	1	5	4	13	10	1	5	9	14	1	1	5	14
172	13	9	1	5	4	14	0	1	5	9	14	3	1	5	14	14	6	1	6	3
174	14	2	1	5	9	14	5	1	5	14	14	8	1	6	3	14	11	1	6	8
176	14	7	1	5	14	14	10	1	6	3	15	1	1	6	8	15	4	1	6	13
178	15	0	1	6	3	15	3	1	6	8	15	6	1	6	13	15	9	1	7	2
180	15	5	1	6	8	15	8	1	6	13	15	11	1	7	1	16	2	1	7	6
182	15	10	1	6	12	16	1	1	7	0	16	4	1	7	5	16	7	1	7	10
184	16	3	1	7	1	16	6	1	7	6	16	9	1	7	10	17	0	1	8	0
186	16	8	1	7	5	16	11	1	7	10	17	2	1	7	15	17	5	1	8	3
188	17	1	1	7	10	17	4	1	7	14	17	7	1	8	3	17	10	1	8	8
190	17	6	1	7	14	17	9	1	8	3	18	0	1	8	8	18	3	1	8	12
192	17	11	1	8	2	18	2	1	8	7	18	5	1	8	11	18	8	1	9	0
194	18	5	1	8	8	18	8	1	8	12	18	11	1	9	0	19	2	1	9	5
196	18	11	1	8	15	19	2	1	9	3	19	5	1	9	8	19	8	1	9	12
198	19	5	1	9	3	19	8	1	9	8	19	11	1	9	12	20	2	1	10	0
200	19	11	1	9	4	20	2	1	9	12	20	5	1	10	0	20	8	1	10	5
202	20	7	1	10	0	20	10	1	10	4	21	1	1	10	8	21	4	1	10	13
204	21	3	1	10	8	21	6	1	10	12	21	9	1	11	0	22	0	1	11	4
206	21	11	1	10	15	22	2	1	11	3	22	5	1	11	8	22	8	1	11	12
208	22	7	1	11	8	22	10	1	11	11	23	1	2	0	0	23	4	2	0	3
210	23	3	1	11	15	23	6	2	0	3	23	9	2	0	7	24	0	2	0	11
212	23	11	2	0	6	24	2	2	0	10	24	5	2	0	14	24	8	2	1	2
214	24	7	2	0	13	24	10	2	1	1	25	1	2	1	5	25	4	2	1	9
216	25	3	2	1	4	25	6	2	1	8	25	9	2	1	12	26	0	2	2	0
218	25	11	2	1	11	26	2	2	1	14	26	5	2	2	2	26	8	2	2	6
220	26	7	2	2	1	26	10	2	2	5	27	1	2	2	9	27	4	2	2	13
222	27	5	2	2	10	27	8	2	2	14	27	11	2	3	2	28	2	2	3	6
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230	30	9	2	4	10	31	0	2	4	14	31	3	2	5	2	31	6	2	5	6
232	31	7	2	5	6	31	10	2	5	9	32	1	2	5	13	32	4	2	6	1
234	32	5	2	5	15	32	8	2	6	2	32	11	2	6	6	33	2	2	6	10
236	33	3	2	6	6	33	6	2	6	10	33	9	2	6	13	34	0	2	7	1
238	34	1	2	6	15	34	4	2	7	2	34	7	2	7	6	34	10	2	7	9

WILLIAM HUSSEY'S (Esq.) Prices.

	S.	D.			S.	D.			S.	D.	
100	4	2		134	6	2		168	10	11	
102	4	3		136	6	4		170	11	4	
104	4	4		138	6	6		172	11	9	
106	4	5		140	6	9		174	12	2	
108	4	6		142	7	0		176	12	7	
110	4	7		144	7	3		178	13	0	
112	4	8		146	7	6		180	13	5	
114	4	9		148	7	9		182	13	10	
116	4	10		150	8	0		184	14	3	
118	4	11		152	8	3		186	14	8	
120	5	0		154	8	6		188	15	1	
122	5	2		156	8	9		190	15	6	
124	5	4		158	9	1		192	15	11	
126	5	6		160	9	5		194	16	5	
128	5	8		162	9	9		196	16	11	
130	5	10		164	10	1		198	17	5	
132	6	0		166	10	6		200	17	11	

Glasgow, 1st May, 1824.

BENJAMIN GRAY'S (Esq.) List, Late Ancoats, Manchester.

	S.	D.			S.	D.			S.	D.	
100	4	2		142	7	0		184	14	3	
102	4	3		144	7	3		186	14	8	
104	4	4		146	7	6		188	15	1	
106	4	5		148	7	9		190	15	7	
108	4	6		150	8	0		192	16	1	
110	4	7		152	8	3		194	16	7	
112	4	8		154	8	6		196	17	1	
114	4	9		156	8	9		198	17	7	
116	4	10		158	9	1		200	18	1	
118	4	11		160	9	5		202	18	9	
120	5	0		162	9	9		204	19	5	
122	5	2		164	10	1		206	20	1	
124	5	4		166	10	6		208	20	9	
126	5	6		168	10	11		210	21	5	
128	5	8		170	11	4		212	22	1	
130	5	10		172	11	9		214	22	9	
132	6	0		174	12	2		216	23	5	
134	5	2		176	12	7		218	24	1	
136	6	4		178	13	0		220	24	9	
138	6	6		180	13	5		222	25	7	
140	6	9		182	13	10		224	26	5	

Glasgow, 1st May, 1824, Watson & Young, Agents.

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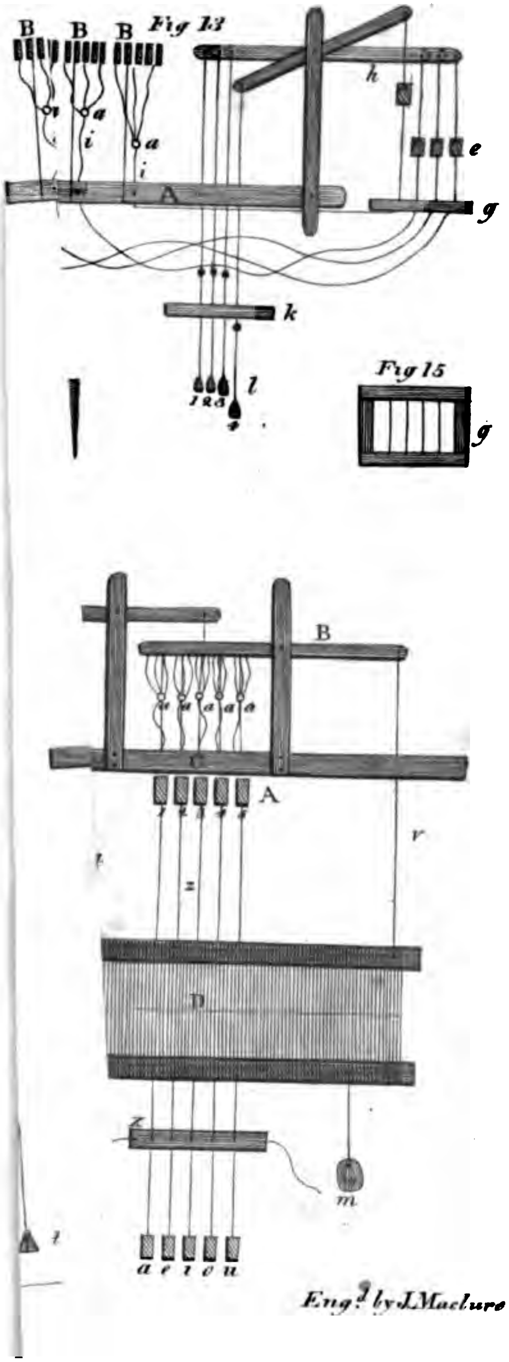

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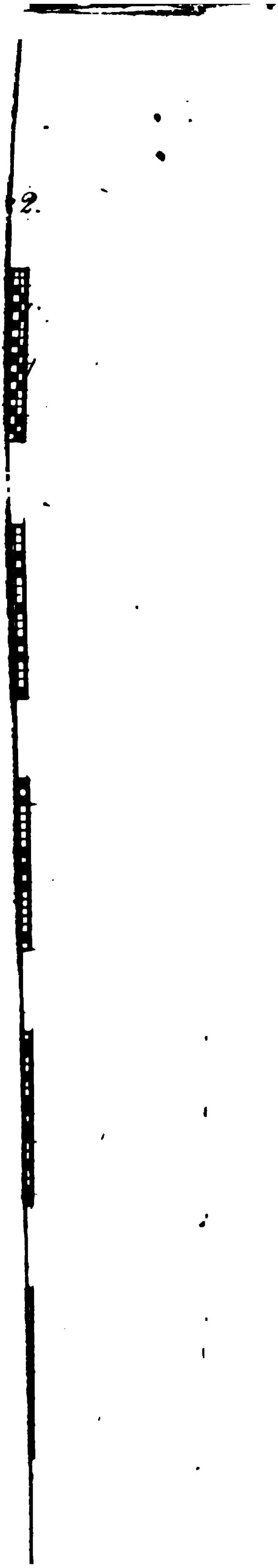
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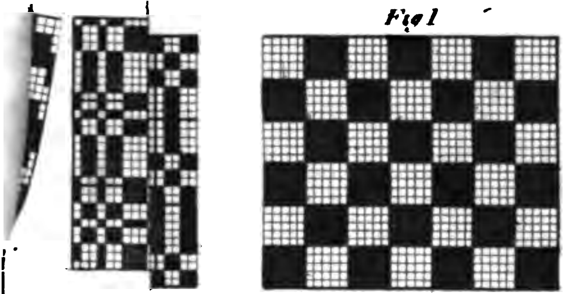

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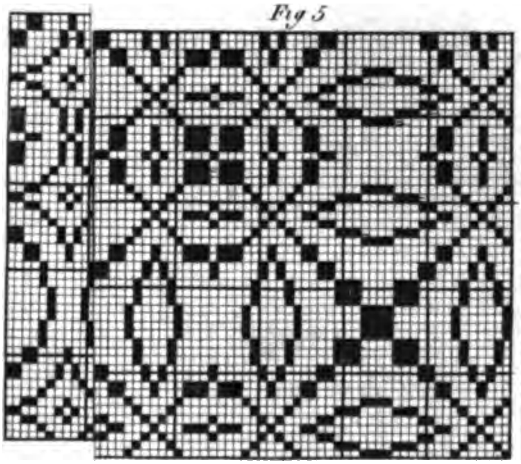

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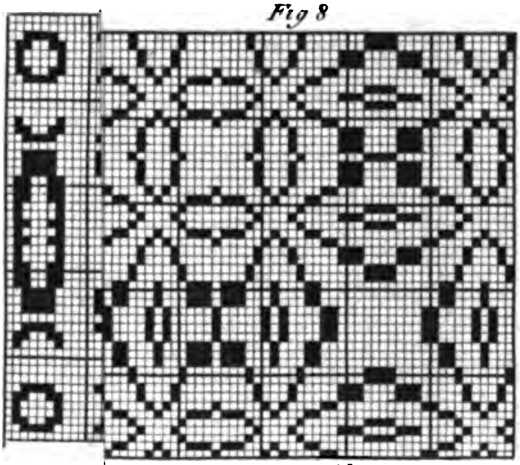

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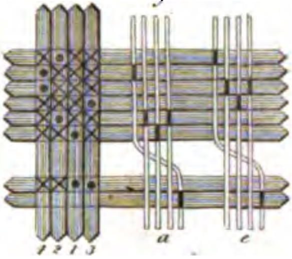

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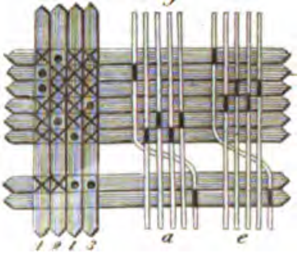

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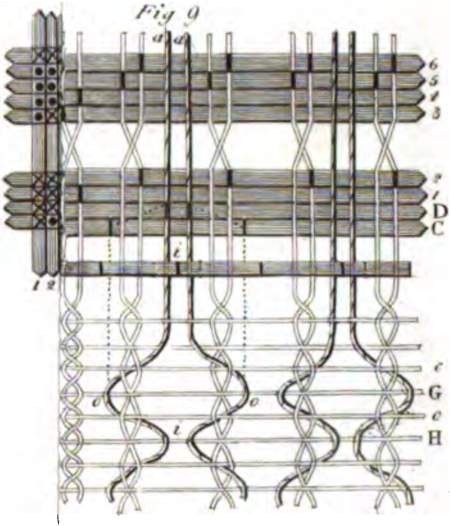

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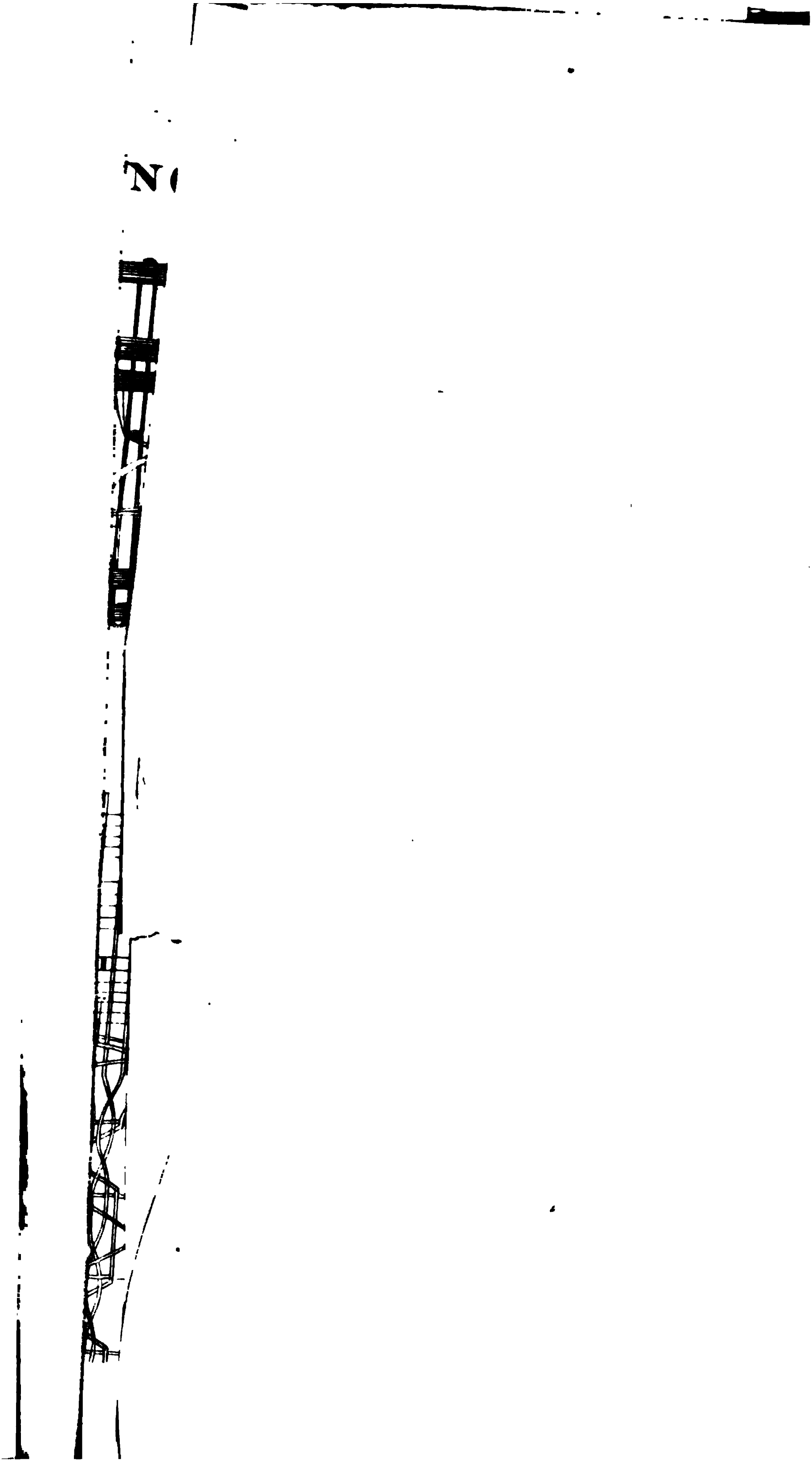
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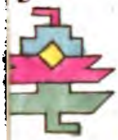

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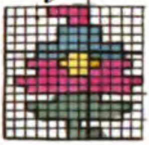

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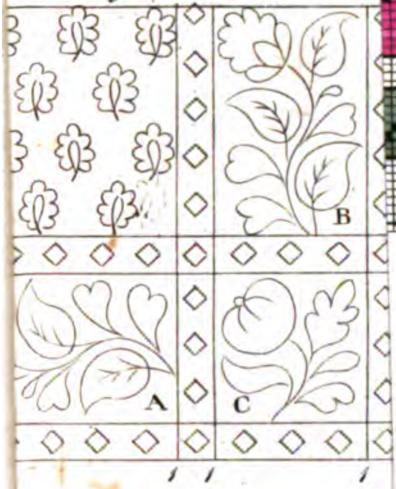

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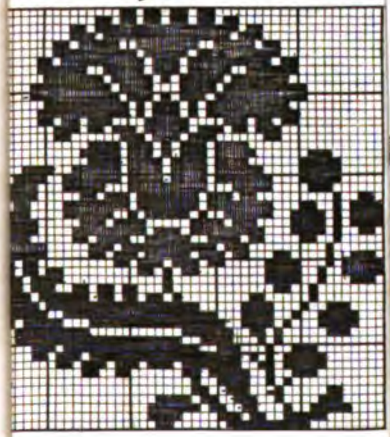

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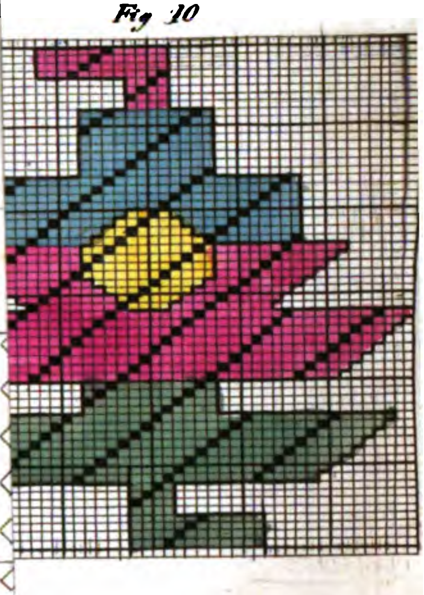

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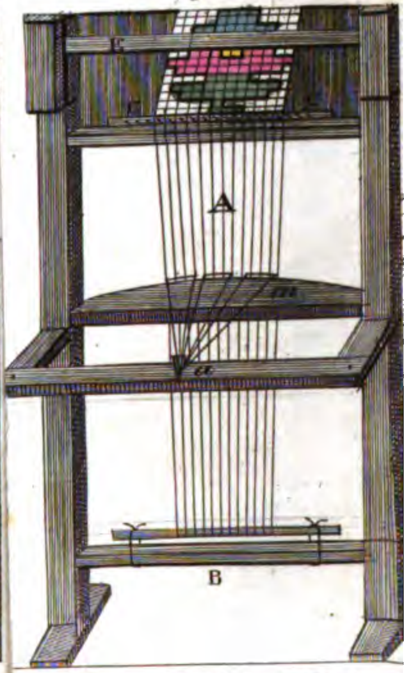

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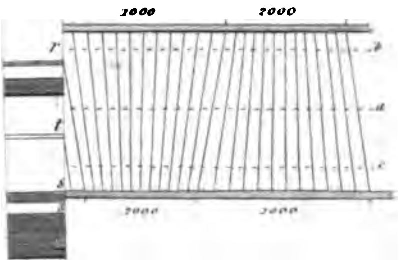

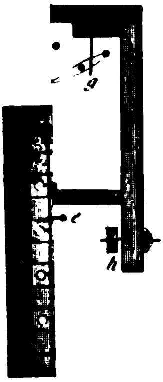

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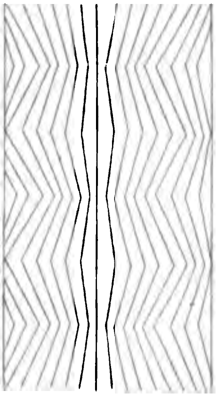

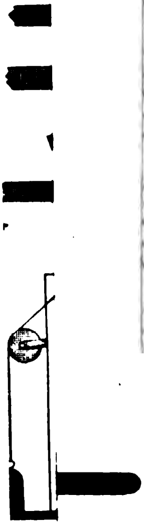

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